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# DRAFT FINAL

KAISER HILL
COMPANY

## PHASE I RFI/RI REPORT

## WOMAN CREEK PRIORITY DRAINAGE
## OPERABLE UNIT NO 5

## ROCKY FLATS ENVIRONMENTAL
## TECHNOLOGY SITE, COLORADO

RMRS Rocky Mountain
Remediation Services, L.L.C
.protecting the environment

## TEXT

Environmental Restoration
Rocky Flats Environmental Technology Site

**Prepared For**

U S DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site
Golden Colorado

ADMIN RECORD

DOCUMENT CLASSIFICATION
REVIEW WAIVER PER
CLASSIFICATION OFFICE

**October 1995**

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| | |
|---|---|
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ACRONYMS

| | |
|---|---|
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |
| 1 1 DCE | 1 1 dichloroethene |
| 1 2 DCE | 1 2 dichloroethene |
| 1 1 1 TCA | 1 1 1 trichloroethane |
| ac ft | acre feet |
| ACGIH | American Conference of Governmental Industrial Hygienists |
| ACM | asbestos containing material |
| AEC | Atomic Energy Commission |
| AOC | Area of Concern |
| ARAR | Applicable or Relevant and Appropriate Requirement |
| BAT® | Bengt Arne Tortensson |
| BGCR | Background Geochemical Characterization Report |
| BOD | biochemical oxygen demand |
| bQ | becquerel |
| BRA | Baseline Risk Assessment |
| BUTL | Background Upper Tolerance Limit |
| CDPHE | Colorado Department of Public Health and Environment |
| CEDE | committed effective dose equivalent |
| CERCLA | Comprehensive Environmental Response Compensation and Liability Act |
| cfs | cubic feet per second |
| CLP | Contract Laboratory Program |
| CMP | corrugated metal pipe |
| cm/sec | centimeters per second |
| cm /sec | square centimeters per second |
| $cm^3$/sec | cubic centimeters per second |
| COC | chemical of concern |
| cpm | counts per minute |
| CPT | cone penetrometer testing |
| CRAVE | Carcinogenic Risk Assessment Verification Endeavor |
| CRQL | contract required quantitation limit |
| CSF | cancer slope factor |
| CSM | conceptual site model |
| CSU | Colorado State University |
| CT | central tendency |
| DCF | dose conversion factors |
| DCN | Document Change Notice |
| DCM | dichloromethane |
| DLG | Digital Line Graph |
| DMR | Document Modification Request |
| DOE | U S Department of Energy |

ACRONYMS (Continued)

| | |
|---|---|
| DQO | data quality objective |
| ECAO | Environmental Criteria and Assessment Office |
| ECOC | ecological chemicals of concern |
| EDE | effective dose equivalent |
| EM | electromagnetic |
| EPA | U S Environmental Protection Agency |
| ER | Environmental Restoration |
| ERA | Ecological Risk Assessment |
| ERAM | ecological risk assessment methodology |
| ERDA | Energy Research and Development Administration |
| $f_1$ | fractional uptake |
| FB | field blank |
| FDM | Fugitive Dust Model |
| FIDLER | Field Instrument for the Detection of Low Energy Radiation |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| ft | feet |
| ft/day | feet per day |
| $ft^2$ | square feet |
| $ft^3/m$ | cubic feet per minute |
| g | gram |
| $g/m^2$ | grams per square centimeter |
| gpm | gallons per minute |
| GRRASP | General Radiochemistry and Routine Analytical Services Protocol |
| Gy | Gray (u/l case) |
| H&S | health and safety |
| HEAST | Health Effects Assessment Summary Tables |
| HHRA | Human Health Risk Assessment |
| HI | hazard index |
| HPGe | high purity germanium |
| HQ | hazard quotient |
| HRR | Historical Release Report |
| HSA | hollow stem auger |
| HSPF10 | Hydrologic Simulation Program Fortran Version 10 |
| IAG | Interagency Agreement |
| IHSS | Individual Hazardous Substance Site |
| IHSS 115 | Original Landfill |
| IHSS 133 1 | Ash Pit 1 |
| IHSS 133 2 | Ash Pit 2 |
| IHSS 133 3 | Ash Pit 3 |
| IHSS 133 4 | Ash Pit 4 |
| IHSS 133 5 | Incinerator |

ACRONYMS (Continued)

| | |
|---|---|
| IHSS 133 6 | Concrete Wash Pad |
| IHSS 142 10 | Pond C 1 |
| IHSS 142 11 | Pond C 2 |
| IHSS 196 | Water Treatment Plant Backwash Pond |
| IHSS 209 | Surface Disturbances |
| IM | interim measure |
| IRA | interim remedial action |
| IRIS | Integrated Risk Information System |
| kg | kilogram |
| LHSU | lower hydrostratigraphic unit |
| LR | laboratory replicate |
| m | meter |
| m/s | meters per second |
| mg/l | milligrams per liter |
| mg/kg | milligrams per kilogram |
| mph | miles per hour |
| mm | millimeter |
| mmhos/m | millimhos per meter |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| MSL | mean sea level |
| nCi/g | nanocuries per gram |
| NCP | National Contingency Plan |
| n d | no date |
| NOAEL | No Observed Adverse Effects Level |
| NPDES | National Pollutant Discharge Elimination System |
| OU | Operable Unit |
| OU 5 | Operable Unit No 5 |
| PAH | polynuclear aromatic hydrocarbon |
| PARCC | precision accuracy representativeness completeness and comparability |
| PCB | polychlorinated biphenyl |
| PCE | tetrachloroethene |
| pCi/L | picocuries per liter |
| pCi/g | picocuries per gram |
| PCOC | potential chemical of concern |
| PET | potential evapotranspiration |
| ppm | parts per million |
| PVC | polyvinyl chloride |
| QA | quality assurance |
| QAA | Quality Assurance Addendum |
| QC | quality control |
| RAAMP | Radioactive Ambient Air Monitoring Program |

ACRONYMS (Continued)

| | |
|---|---|
| RAGS | Risk Assessment Guidance Superfund |
| RBC | risk based concentration |
| RCA | radiologically controlled area |
| RCRA | Resource Conservation and Recovery Act |
| RFA | Rocky Flats Alluvium |
| RfC | reference concentration |
| RfD | reference dose |
| RFEDS | Rocky Flats Environmental Database System |
| RFETS | Rocky Flats Environmental Technology Site |
| RFI/RI | RCRA Facility Investigation/Remedial Investigation |
| RFP | Rocky Flats Plant |
| RME | reasonable maximum exposure |
| RPD | relative percent difference |
| s | seconds |
| SBDC | South Boulder Diversion Canal |
| SEP | Systematic Evaluation Program |
| SID | South Interceptor Ditch |
| SOP | standard operating procedure |
| SVOC | semi volatile organic compound |
| TAL | target analyte list |
| TB | trip blank |
| TCE | trichloroethene |
| TCL | toxic compound list |
| TDEM | time domain electromagnetic |
| TEDE | total effective dose equivalent |
| TIC | tentatively identified compound |
| TM | Technical Memorandum |
| TRV | toxicity reference values |
| TSS | total suspended solids |
| UCL | upper confidence limit |
| UHSU | upper hydrostratigraphic unit |
| USCS | Unified Soil Classification System |
| USGS | United States Geological Survey |
| UTL | Upper Tolerance Limit |
| VOC | volatile organic compound |
| WDM | Watershed Data Management |

# EXECUTIVE SUMMARY

This report presents the results obtained during implementation of the Work Plan for the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) of the Woman Creek PriorityDrainage (Operable Unit No 5 ([OU 5]) at the Rocky Flats Environmental Technology Site (RFETS) formerly known as the Rocky Flats Plant (RFP) Jefferson County Colorado as amended This investigation is pursuant to a Compliance Agreement among the U S Department of Energy (DOE) the U S Environmental Protection Agency (EPA) and the Colorado Department of Public Health and the Environment (CDPHE) dated July 31 1986 and an Interagency Agreement (IAG) among DOE EPA and CDPHE dated January 22 1991

The purpose of the OU 5 Phase I RFI/RI is to assess the potential contamination associated with the Individual Hazardous Substance Sites (IHSSs) that are located within the Woman Creek drainage Data collected under the field investigation portion of the RFI/RI were used to estimate risks to human health and the environment, to begin developing and screening remedial alternatives and to evaluate the need for further studies of the OU 5 IHSSs

Eleven IHSSs geographically located along or within the drainage areas of Woman Creek, have been designated as OU 5 These IHSSs include the Original Landfill (IHSS 115) Ash Pits Former Incinerator Area, and Concrete Wash Pad (IHSSs 133 1 through 133 6) Detention Ponds C 1 and C 2 (IHSSs 142 10 and 142 11) and a Surface Disturbance (IHSS 209) Ponds C 1 and C 2 are the only IHSSs located on Woman Creek. The remaining IHSSs are located along the banks and/or upland areas that drain into Woman Creek or into the South Interceptor Ditch (SID) In addition to these IHSSs two additional surface disturbances are being investigated in the Phase I OU 5 investigation a Surface Disturbance West of IHSS 209 and a Surface Disturbance South of the Ash Pits See Figure 1 2

On May 27 1993 EPA and CDPHE notified DOE that IHSS 196 Water Treatment Plant Filter Backwash Pond was to be included in the OU 5 investigation This IHSS was previously scheduled to be investigated as part of OU 16 Low Priority Sites Because of its proximity to IHSS 115 the investigation of IHSS 196 was conducted concurrently with that of IHSS 115

The OU 5 Phase I RFI/RI was conducted in two phases of distinct field programs The first program was the field investigation specified in the OU 5 Phase I RFI/RI Work Plan This investigation was conducted from September 1992 through August 1993 and included as many as four phases of work performed at each IHSS During the course of this investigation ten technical memoranda (TMs) were prepared to evaluate the data collected under each stage of the investigation and to further define the activities to be performed in subsequent investigations

Upon completion of the field investigation specified in the OU 5 Phase I RFI/RI Work Plan as amended by the TMs the data collected under this investigation were evaluated It was determined from this evaluation that additional data were required to assist in the definition of the nature and extent of contamination associated with each IHSS and to collect data required for the evaluation of potential remedial alternatives for the OU 5 Feasibility Study (FS) Technical Memorandum No 15 (TM15) was prepared to document the evaluation of the data collected during the OU 5 Work Plan investigation and to provide an amended Field Sampling Plan (FSP) This TM enabled the additional data required to be collected under the Phase I RFI/RI for OU 5 rather than proceeding with a Phase II RFI/RI This additional field program was conducted from September 1994 through August 1995

The Phase I RFI/RI Work Plan for OU 5 Woman Creek Priority Drainage is a Controlled Document available for viewing in the Public Reading Rooms as specified in the IAG TM 15 Amended Field Sampling Plan is included as Volume III IV and V of the Phase I RFI/RI Work Plan of OU 5 Woman Creek Priority Drainage Text to TM15 Amended Field Sampling Plan (Vol I Text) Text to TM15 Amended Field Sampling Plan (Vol II Text) Text to TM15 Amended Field Sampling Plan (Vol III Appendices A G)

Field investigations indicate that the site physical characteristics are complex Site meteorologic geologic hydrologic and hydrogeologic processes combined interactively to provide mechanisms and pathways for surface and subsurface constituents to migrate through the environment For example because some upper hydrostratigraphic unit groundwater pathways discharge to surface water within OU 5 there is limited potential for migration of volatile organic compounds (VOCs) to offsite locations

The nature and extent of environmental contamination within OU 5 have been characterized through the collection analysis and assessment of hundreds of samples (Tables 2 1through 2 10) of various environmental media Environmental samples were analyzed for a comprehensive suite of chemicals to help characterize potential contamination associated with waste handling and disposal practices conducted during the operating history of the Site The OU 5 data assessment process including rigorous data validation was designed to be conservative to ensure a comprehensive understanding of potential contamination conditions in OU 5

The results of the OU 5 data assessment indicated the presence of potential chemicals of concern (PCOCs) in surface soil subsurface soil groundwater pond seep and stream water and pond, seep and stream sediments PCOCs identified in one or more of these environmental media include VOCs semi volatile organic compounds (SVOCs) polychlorinated biphenyls (PCBs)/pesticides metals and other nonradioactive inorganic constituents and radionuclides The list of PCOCs for each medium was then screened using risk based and other screening methods to identify chemicals of concern (COCs) for both the Human Health Risk Assessment (HHRA) and the Ecological Risk Assessment (ERA) COCs were identified as the chemicals in each medium that were likely to contribute at least one percent of overall risk. For the HHRA COCs were selected on an OU wide basis for the ecological risk assessment (ERA) the COCs were identified for the Woman Creek watershed In groundwater and surface water metals and radionuclides are the primary COCs however in seep water the COCs are all VOCs The COC s in surface soil and subsurface soil include uranium isotopes several metals polynuclear aromatic hydrocarbons (PAHs) and PCBs The COC s identified in stream and pond sediments are radionuclides and metals Table 6-25 in Section 6 presents the COCs identified for OU 5

The presence of COCs in all media is a result of historical releases to the environment. Under the hydrogeochemical conditions of OU 5 metals and radionuclides are not expected to be very mobile via the groundwater pathway However storm water runoff may transport contaminated soils to surface waters with subsequent transport to downstream receptors The presence of COCs in stream, seep and pond sediments is likely a result of surface water transport of contaminated surface soils to Woman Creek. Fugitive dust emissions from OU 5 surface soils and dry sediments may contribute contaminated particulates to future onsite receptors Exposure to subsurface soils by future onsite construction workers may result in contaminant inhalation and ingestion Numerical modeling was used to examine the migration of COCs along pathways in groundwater surface water and air The numerical models provided COC concentration tables for the HHRA

The OU 5 HHRA indicate that there are estimated health risks and annual radiation doses for current and future onsite receptors as a result of indirect or direct exposure from sources in OU 5 The following exposure scenarios were evaluated a current industrial worker (security guard) a future industrial/office worker a future ecological researcher a future open space recreational user and a future construction worker Future onsite residential receptors were not considered in the HHRA because future land use plans do not include residential use It was determined during HHRA negotiations with the regulatory agencies that health risks to offsite receptors would not be addressed on an OU specific basis but on a sitewide basis

For the HHRA exposure media that were evaluated included surface soil subsurface soil outdoor and indoor air stream seep and pond water and stream seep and pond sediments Groundwater was not evaluated as an exposure pathway because there are no current or future receptors

Risks were evaluated for three Areas of Concern (AOCs) AOC No 1 is the Original Landfill (IHSS 115/196 Source Area) AOC No 2 includes the Ash Pits (IHSS 133 Source Area) AOC No 3 includes the SID Ponds C 1 and C 2 Source Areas and the Woman Creek. See Figure 6 1

The risk characterization process combines average and reasonable maximum estimates of exposure with upperbound estimates of toxicity to yield conservative (protective) estimates of health risk. Estimates of health risk for average (central tendency or CT) and reasonable maximum exposure (RME) conditions are provided so that risk management decisions can be based on a range of potential risks for different exposure scenarios

The following are the major conclusions of the HHRA

- AOC1 Cumulative hazard indices (HIs) were below 1 and RME cancer risk estimates were 3E-05 or below for all receptors The maximum cancer risk estimate of 3E-05 is for both the current worker (security guard) and the future office worker This risk is still within EPA s acceptable risk range of 1E 06 to 1E-04 External irradiation due to exposure of uranium 238 in surface soil is the primary contributor to this estimate of cancer risk

- AOC2 Cumulative HIs were below 1 and RME cancer risk estimates were 4E-06 or below for all receptors The maximum cancer risk estimate of 4E 06 is for both the current worker (security guard) and the future office worker This risk is at the low end of EPA s acceptable risk range of 1E 06 to 1E 04 External irradiation due to exposure of uranium 238 in surface soil is the primary contributor to this estimate of cancer risk

- AOC3 Cumulative HIs were below 1 and the RME cancer risk estimates were below EPA s point of departure of 1E 06 for both receptors These results indicate that no adverse noncarcinogenic health hazards and negligible cancer risk are expected for all receptors evaluated

The ERA for Woman Creek was conducted for aquatic and terrestrial biota exposed to contaminants in OUs 1 2 and 5 Assessment of ecological risks was based on evaluating exposure of biological receptors to PCOCs in designated ERA source areas Source areas include individual or groups of IHSSs within an OU and were based on abiotic and biotic sampling locations in and around IHSSs A preliminary exposure and risk calculation was conducted for PCOCs in source areas The analysis was conducted to estimate the contribution of each PCOC and each source area to overall risk in the watershed. Ecological chemicals of concern (ECOCs) were identified from preliminary risk calculations and evaluated further in risk characterization

Ecotoxicological risk to terrestrial receptors in OU 5 was minimal Concentrations (activities) of uranium 233/234 and uranium 238 in soils exceeded the risk based screening criteria developed for the Site However the criteria were exceeded in only two locations both of which are in the Old Landfill source area and which represent a negligible portion of habitat in the watershed Maximum concentrations of radionuclides in small mammals were not associated with levels that exceed the benchmarks for safe radiological doses Thus risk from exposure to radionuclides appears to be minimal

The screening level assessment also indicated that concentrations of mercury antimony and Aroclor 1254 could represent risks to aquatic feeding birds if they acquired all of their food from the SID Pond C 1 and segments of Woman Creek. However it is unlikely that birds would spend all of the time in the areas of concern, because the size and quality of habitat in these areas is inadequate to support their needs.

The results of the HHRA and the ERA support the conclusions that environmental contamination within OU 5 does not pose a threat to public health or the environment under the evaluated exposure scenarios and that remediation of environmental media to address risk to public health and the environment is not warranted

# 1 0 INTRODUCTION

This report presents the results obtained during implementation of the Work Plan (DOE 1992a) for the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) of the Woman Creek Priority Drainage (Operable Unit No 5 [OU 5]) at the Rocky Flats Environmental Technology Site (RFETS) formerly known as the Rocky Flats Plant (RFP) Jefferson County Colorado as amended (DOE 1992a,1994a) This investigation is pursuant to a Compliance Agreement among the U S Department of Energy (DOE) the U S Environmental Protection Agency (EPA) and the Colorado Department of Public Health and the Environment (CDPHE) dated July 31 1986 and an Interagency Agreement (IAG) among DOE EPA and CDPHE dated January 22 1991 The IAG addresses RCRA and Comprehensive Environmental Response Compensation and Liability Act (CERCLA) issues and has been integrated with DOE s Environmental Restoration (ER) Program (IAG 1991)

## 1 1 PURPOSE OF PROJECT

The purpose of the OU 5 Phase I RFI/RI is to assess the potential contamination associated with the Individual Hazardous Substance Sites (IHSSs) that are located within the Woman Creek drainage The data collected under the field investigation portion of the RFI/RI are used to estimate risks to human health and the environment begin developing and screening remedial alternatives and to evaluate the need for further studies of the OU 5 IHSSs

## 1 2 BACKGROUND

### 1 2 1 Plant Operations

The site (Figure 1 1) is a government-owned and contractor operated facility that is part of the nationwide nuclear weapons production complex RFP was operated for the U S Atomic Energy Commission (AEC) from construction in 1951 until the AEC was dissolved in January 1975 At that time responsibility for the RFP was assigned to the Energy Research and Development Administration (ERDA) which was succeeded by the DOE in 1977 Dow Chemical USA an operating unit of the DOW Chemical Company was the prime operating contractor of the facility from 1951 until June 30 1975 Rockwell

International succeeded Dow Chemical USA from July 1 1975 to January 1 1990 when EG&G Rocky Flats Inc succeeded Rockwell International On July 1 1995 Kaiser Hill LLC succeeded EG&G Rocky Flats Inc as the prime operating contractor

Currently the primary mission at the Site is environmental restoration The name was changed from RFP to Rocky Flats Environmental Technology Site in September 1994 Historically the primary mission was to produce metal components for nuclear weapons These components were fabricated from plutonium uranium and nonradioactive metals principally beryllium and stainless steel Metal components were shipped elsewhere for final assembly When nuclear weapons were determined to be obsolete components of the weapons were returned for special processing to recover plutonium and americium Other activities included research and development in metallurgy machining nondestructive testing coatings remote engineering chemistry and physics Both radioactive and nonradioactive wastes have been and are generated in these research and production processes Current waste handling practices involve onsite and offsite recycling of hazardous materials onsite storage of hazardous and radioactive mixed wastes and disposal of solid radioactive materials at other DOE facilities However historically the site operating procedures included both onsite storage and disposal of hazardous and radioactive wastes

### 1 2 2 OU 5 (Woman Creek)

Eleven IHSSs geographically located along or within the drainage areas of Woman Creek (Figure 1 2) have been designated as OU 5 These IHSSs include the Original Landfill (IHSS 115) Ash Pits Incinerator and Concrete Wash Pad (IHSSs 133 1 through 133 6) Detention Ponds C 1 and C 2 (IHSSs 142 10 and 142 11) and a Surface Disturbance (IHSS 209) Ponds C 1 and C 2 are the only IHSSs located on Woman Creek The remaining IHSSs are located along the banks and/or upland areas that drain into Woman Creek or into the South Interceptor Ditch (SID) In addition to these IHSSs two additional surface disturbances are being investigated in the Phase I OU 5 investigation a Surface Disturbance West of IHSS 209 and a Surface Disturbance South of the Ash Pits

In 1980 the SID (Figure 1 7) was constructed upslope (to the north) of Woman Creek to intercept surface water run off from the southern portion of the Industrialized Area, and more specifically from the

881 Hillside The SID begins near the east end of an Ash Pit (IHSS 133 2) parallels the creek cuts through the toe of the Original Landfill (IHSS 115) and continues below the 881 Hillside French Drain The SID crosses under the Woman Creek Diversion Ditch then empties into Pond C 2 A berm was constructed on the downslope side of the SID to contain the water flowing into the ditch The construction of the SID through the toe of the Original Landfill has contributed to the formation of slump features that are apparent within that area

On May 27 1993 EPA and CDPHE notified DOE that IHSS 196 Water Treatment Plant Filter Backwash Pond was to be included in the OU 5 investigation This IHSS was previously scheduled to be investigated as part of OU 16 Low Priority Sites Because of its proximity to IHSS 115 the investigation of IHSS 196 was conducted concurrently with that of IHSS 115

### 1 2 2 1 OU 5 IHSS Descriptions and Histories

The following sections describe the locations physical features and histories of each of the OU 5 IHSSs These discussions are primarily based on the information provided in the OU 5 Work Plan (DOE 1992a) and additional information that was obtained during the course of the investigation of the IHSSs and that provide further detail regarding the location description and history of the IHSSs

<u>IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)</u> The Original Landfill is located within the buffer zone just south of the site industrialized area and south of the west access road (Figure 1 3) It is located north of Woman Creek on a moderately to steeply sloping south facing hillside

The Original Landfill was in operation from 1952 to 1968 and was used to dispose of general wastes generated at the Site It is estimated that 2 million cubic feet of miscellaneous Site wastes are buried in the landfill including such things as solvents paints paint thinners oil pesticides cleaners (Rockwell 1988) construction related debris waste metal and glass These wastes were not considered hazardous prior to 1968 when they were placed in the landfill The landfill also received beryllium and/or uranium wastes and used graphite It has been reported that ash containing an estimated 20 kilograms (kg) of depleted uranium (DOE 1986) produced when 60 kg of depleted uranium were inadvertently burned and only 40 kg were recovered was buried within the landfill Chemicals that may have been placed in this landfill include commonly used solvents such as trichloroethene (TCE) carbon tetrachloride tetrachloroethene

(PCE) petroleum distillates 1 1 1 trichloroethane (1 1 1 TCA) dichloromethane (DCM) benzene paint and paint thinners Metals such as beryllium uranium lead and chromium may also be present (Rockwell 1988) Accurate records of any further wastes placed in this landfill are not available

IHSS 196 an evaporation/settling pond that was used for backflushing sand filters from the water treatment facility (Building 124) was located within the boundaries of the Original Landfill near the western edge (Figure 1 3) It appears that a second pond (visible in a 1955 aerial photograph in the approximate location of the SID) was constructed but by 1964 this pond was no longer present and the area had been covered by fill (DOE 1992a)

By 1980 the SID had been built across the southern part of the landfill Several other activities at the landfill are apparent from aerial photographs of the area presented in EPA (1988a) A1964 aerial photograph shows an active area of surface disturbance east of the landfill Little documented historical information is available concerning this area however this area may have served as a storage yard for pipes and scrap metal In addition soil appears to have been placed in this area as substantial mounds of debris are noted in this area, as shown in 1969 and 1971 aerial photographs (EPA 1988a)

The landfill was closed with a soil cover however a bottom liner was not installed Details of the construction of the surface cover are not available nor is the year the cover was installed The slope on the south side of the landfill was regraded to correct sloughing and erosion related problems

Two storm sewer pipes protrude from the landfill area (Figure 1 3) The west pipe is no longer connected to a drainage system The pipe which cuts diagonally across the landfill from west to east, appears to be connected to storm drains and possibly to foundation drains in the 400 Area (Section 2 4 5) This pipe discharges to the SID just east of the surface disturbance east of the landfill

IHSS 133 (Ash Pits, Former Incinerator Area, and Concrete Wash Pad) The Former Incinerator Area, Ash Pits and Concrete Wash Pad are located south southwest of the industrialized area of the site south of the west access road and north of Woman Creek (Figure 1 4) The locations of these IHSSs are defined from historic aerial photographs The Former Incinerator which had a 10 to 20-foot stack, was located along the original western boundary of the site off the west access road Ash Pits 1 2 3 4 (IHSSs 133 1 133 2 133 3 133 4) and time domain electromagnetic area (TDEM) 1 and TDEM 2 are approximately 20 feet (ft) wide by 150 ft long and 8 18 ft deep Two additional ash pits were identified and are referred to as TDEM 1 and TDEM 2 in this report The Ash Pits are located on a relatively flat surface and are currently covered by tall grasses

The Former Incinerator Area (IHSS 133 5) occupies approximately 4 000 square feet ($ft^2$) and the Concrete Wash Pad (IHSS 133 6) covers an area of about 33 000 $ft^2$ These two IHSSs are located west of the four original Ash Pits The area surrounding the Concrete Wash Pad has an extremely irregular hummocky surface that slopes gently to the south toward Woman Creek

The Incinerator was used to burn general site wastes between the 1950s and 1968 Depleted uranium is also believed to have been burned in the Incinerator (Rockwell 1988) A review of aerial photographs revealed that the Incinerator was removed by 1971 and the entire area was beginning to revegetate (EPA 1988a) Ashes from the Incinerator were placed into the Ash Pits or were pushed over the side of the hill into the Woman Creek drainage and/or onto the Concrete Wash Pad (Rockwell 1988) Following the shutdown of the Incinerator after 1968 the Ash Pits were covered with fill (Rockwell 1988) however information about the material used in the construction of the cover is unavailable

The history of the Concrete Wash Pad has not been as well documented as the Ash Pits or Former Incinerator area. It appears that this area was used to dispose of waste concrete from the concrete trucks involved in the construction activities of the site It is also likely that the concrete trucks were washed down in this area after delivering concrete

The histories of the Ash Pits Incinerator and Concrete Wash Pad are not entirely known because few records were kept of their operations It is known however that general combustible wastes from the site were burned in the Incinerator along with an estimated 100 grams of depleted uranium (Owen and Steward 1973) which were disposed of into the ash pits and 60 kg was burned of which 20 kg was disposed into the original landfill The ashes from the Incinerator were disposed in the Ash Pits At the Concrete Wash Pad, potentially contaminated materials consist of concrete debris and small amounts of ash from the Incinerator that were reported to have been pushed over the side of the hill onto the Concrete Wash Pad area (Rockwell 1988)

A rayscope survey (an unknown type of survey) was conducted over Ash Pıt 3 (IHSS 133 3) prıor to 1973 and the results of thıs survey detected metals (type unknown) (DOE 1987) No documentatıon exısts as to whether the other Ash Pıts (IHSSs 133 1 133 2 and 133 4) had a rayscope survey done over theır surfaces

IHSS 142.10 and 142.11 (C Ponds) Ponds C 1 (IHSS 142 10) and C 2 (IHSS 142 11) are located along Woman Creek southeast of the ındustrıalızed area of the sıte and wıthın the Buffer Zone (Fıgure 1 2) These ponds are approxımately 2 000 ft apart wıth Pond C 1 to the west of Pond C 2 The estımated capacıtıes for Ponds C 1 and C 2 are approxımately 5 acre feet (ac ft) and 69 8 ac ft, respectıvely

The natural draınage of Woman Creek has been somewhat modıfıed ın the OU 5 area by the constructıon of Ponds C 1 and C 2 and the SID south of the ındustrıal area. Currently Woman Creek flows eastward through OU 5 ın ıts natural stream channel to Pond C 1 (Fıgure 1 2) Fılter backwash water from the water treatment facılıty was dıscharged ın Pond C 1 between the sıte start up ın 1952 and December 21 1973 (DOE 1980) In addıtıon the coolıng tower blowdown water was dıscharged to Pond C 1 untıl the latter part of 1974 In the early 1970s the sıte operatıons were changed and Pond C 1 was used prıncıpally to manage the surface water runoff ın the Woman Creek draınage Water ıs rarely retaıned wıthın thıs pond because the outlet or gate ıs usually open and the water ıs allowed to flow through the pond The water consequently flows ın ıts natural channel untıl just west of Pond C 2 where ıt ıs dıverted around Pond C 2 by a dıversıon canal Durıng low flows downgradıent and to the east of Pond C 2 all of the water ıs dıverted from Woman Creek s maın channel ınto an unnamed dıtch that flows ınto Mower Reservoır Durıng hıgh flows some flow contınues to flow downstream ın Woman Creek and ınto Standley Lake Reservoır

In 1980 the SID was constructed upslope (to the north) of Woman Creek (Fıgure 1 2) to ıntercept surface runoff from the sıte A berm was constructed on the downslope sıde of the SID to contaın the water flowıng ın thıs dıtch Sınce constructıon of the SID ın 1980 Woman Creek has not receıved runoff dırectly from the southern part of the sıte Surface water flow ın the SID ıs ıntermıttent and usually occurs only followıng precıpıtatıon events or snow melt. When flow ıs low water tends to pond in several areas of the dıtch The SID begıns approxımately 200 ft east of the Ash Pıts and runs for almost two mıles to Pond C 2 (Fıgure 1 2) The SID ıs approxımately 4 to 8 ft ın depth and ıs not lıned Just upslope of Pond C 2 the water flowıng ın the SID crosses over Woman Creek and flows ınto Pond C 2 In Pond C 2 the water is sampled analyzed and discharged into the Broomfield Diversion Ditch that diverts water around Great Western Reservoir according to a National Pollutant Discharge Elimination System (NPDES) agreement (Permit No CO 0001333)

<u>IHSS 209 and Other Surface Disturbances</u> Three separate surface disturbances are described in this section (1) IHSS 209 (2) the Surface Disturbance West of IHSS 209 and (3) the Surface Disturbance South of the Ash Pits IHSS 209 is located to the southeast of the site industrialized area, south of Woman Creek and approximately 1 000 ft southeast of Pond C 1 (IHSS 142 10) (Figure 1 5) This area was included as an IHSS because unknown activities took place in this area of shallow excavations and surface disturbances (DOE 1992a) IHSS 209 covers approximately 225 000 $ft^2$ (5 2 acres) and is located on a long narrow plateau bounded to the north east, and south by a slope leading into the Woman Creek drainage A dirt road transects this IHSS and loops near the eastern boundary Three excavations are located within the boundary of this IHSS Two depressions which periodically retain water are present near the northern and southwestern boundary of the IHSS

A second surface disturbance the Surface Disturbance West of IHSS 209 located approximately 1 500 ft west of IHSS 209 is also included in the OU 5 investigation The area consists of several small disturbed areas in a somewhat symmetric arrangement (Figure 1 5) This disturbance covers an area of approximately 62 500 $ft^2$ (approximately 1 4 acres)

A third surface disturbance area the Surface Disturbance South of the Ash Pits is also being investigated under the OU 5 RFI/RI This area is located 1 200 ft south of IHSS 133 and south of Woman Creek. This area consists of several former excavation areas (Figure 1 6) These surface disturbances were identified in aerial photographs taken between 1955 and 1988 (see EPA 1988a) There is still surface evidence of some of these disturbances Two former excavations trend along northeast southwest axes Each excavation is approximately 30 ft wide by 400 ft long A third area is located northeast of the parallel excavations and a fourth excavation (3 ft wide by approximately 2 ft deep) is located to the southwest This excavation trends in a north south direction across the plateau An additional disturbed area is approximately 150 ft wide by 600 ft long and is located upslope (southwest) from the other disturbances

It is not known what activity or activities may have taken place at IHSS 209 or at the other surface disturbances However the time period in which these areas were disturbed has been estimated from aerial photographs (EPA 1988a)

IHSS 209 first appears as a disturbed area seen in a 1955 aerial photograph (EPA 1988a) The ground was disturbed both west and east of the dirt road however no obvious features or equipment can be seen in the photo By 1961 three excavations existed within this IHSS The depression located near the southwestern boundary of this IHSS appears as a pond in 1980 1983 and 1988 aerial photographs (EPA 1988a) A 1980 aerial photograph also reveals that the western half of the IHSS was beginning to revegetate By 1988 the only recognizable features on or near this surface disturbance were the presence of the eastern most excavation and the pond located near the northern boundary of this IHSS (Figure 1 5)

The OU 5 Work Plan stated that the Surface Disturbance West of IHSS 209 appears to have been the location of a radio tower installation based on the geometry of the five disturbances at this site This surface disturbance was observed in a 1955 aerial photograph and was still evident on photographs until about 1971 when the area started revegetating A radio tower however was never viewed in the aerial photographs

The east excavation area was the first area to be noted as active in the Surface Disturbance South of the Ash Pits This was observed in a 1955 aerial photograph The two parallel excavations became active prior to 1978 and they are visible in a 1978 photo (EPA 1988a) After 1983 the excavated areas started to revegetate The west area located approximately 400 ft southwest of the parallel excavations became active prior to 1969 (EPA 1988a) and is now backfilled with large rocks It is not known when these rocks were placed

### 1 2 3 Other Investigations

To the extent they are applicable the results of other the site investigations were incorporated into this investigation The scope of these other investigations is briefly described in the following sections

### 1 2 3 1 Sitewide Geological Characterization

The Sitewide Geoscience Characterization Study was performed to compile and integrate all available information in order to develop a conceptual model of the geologic hydrogeologic and geochemical conditions at the site The results of this study were documented in three reports the Geologic Characterization Report (EG&G 1995a) the Hydrogeologic Characterization Report (EG&G 1995b) and the Groundwater Geochemistry Report (EG&G 1995c) The information presented in these reports was integrated into the discussions of the geology and hdyrogeology of OU 5 presented in Chapter 3 0

### 1 2 3 2 Sitewide Background Geochemical Characterization

The IAG required DOE to conduct a background study to establish representative background concentrations for various environmental media and to prepare background study reports periodically to document the results of this study The 1993 Background Geochemical Characterization Report (BGCR) (DOE 1993a) presents the final results of this program and provides background data for surface water sediments groundwater and borehole materials These data are necessary to support RFI/RIs as well as RCRA interim measures (IMs) and CERCLA interim remedial actions (IRAs)

Analytical results for samples collected under the OU 5 RFI/RI were compared to the background data provided in the 1993 BGCR to determine whether or not the concentrations detected in OU 5 environmental media statistically exceeded those of background Section 4 2 discusses the methodology used for this comparison

### 1 2 3 3 Sitewide Surface Water Studies

Several studies have been or continue to be conducted pertaining to analyses of surface water stream sediments and pond sediments in the Woman Creek drainage and Ponds C 1 and C 2 The historical data for these media were evaluated in Technical Memorandum No 1 (TM1) to assist in the design of a monitoring network for the OU 5 Phase I RFI/RI (DOE 1993b also see Section 1 3 2 1) and were also used to determine the nature and extent of contamination within the Woman Creek drainage The surface water and sediment investigations and associated results are described in detail in Appendix A and are discussed in the applicable sections of Chapters 2 0 3 0 and 4 0

### 1 2 3 4 Sitewide Groundwater Characterization

Prior to the OU 5 Phase I RFI/RI field investigations a total of 64 alluvial and bedrock wells existed in the vicinity of the Woman Creek drainage Many of these wells have been or continue to be sampled as part of the sitewide groundwater monitoring program or for the investigation of other operable units (OUs) in the vicinity of OU 5 In addition water levels are routinely measured in most of these wells To the extent that the data from these wells met the quality requirements of the OU 5 RFI/RI they were incorporated into this investigation Appendix A provides a discussion of the available historical data from these wells These data are also discussed where appropriate in the Chapters 2 0 3 0 and 4 0

## 1 3 SUMMARY OF PHASE I RFI/RI WORK PLAN AND TECHNICAL MEMORANDA

The Phase I RFI/RI Work Plan for OU 5 presents a Field Sampling Plan (FSP) that defines a staged approach to investigating each IHSS The Work Plan outlines the use of an Observational Approach to achieve the objectives of the RFI/RI This technique provides for continually reassessing site conditions as additional data are obtained Sampling plans for subsequent stages of investigation are formulated to build on existing information These sampling plans are submitted as TMs to EPA and CDPHE for review prior to implementation The OU 5 Work Plan contains nine TMs to be prepared to outline sampling plans for investigations of the OU 5 IHSSs and four TMs be prepared to discuss Human Health Risk Assessment (HHRA) activities A total of eleven TMs were prepared to describe planned field investigations during the implementation of the Phase I FSP at OU 5 (TMs 1 10 and 15) Three TMs were also prepared to describe specific phases of the HHRA The following paragraphs summarize the FSP outlined by the OU 5 Work Plan and as amended by each of the TMs as well as the scope of the TMs prepared for the HHRA

## 1 4 ENVIRONMENTAL EVALUATION

The ecological risk assessment (ERA) portion of the baseline risk assessment was completed as part of an overall ERA conducted for the Walnut Creek and Woman Creek watershed The complete ERA report for both watersheds is presented in Appendix N An overview of the scope approach results and conclusions for the Woman Creek watershed is presented in Section 7 0

## 1 4 1 Phase I RFI/RI Work Plan for OU 5 (Woman Creek)

The OU 5 Work Plan identified site specific data needs based on preliminary identification of contaminants potentially present at each IHSS in addition to the data needs for the Phase I Baseline Risk Assessment and Environmental Evaluation The FSP presented in the OU 5 Work Plan was based on these data needs and the requirements of the IAG between DOE EPA and CDPHE The FSP for each IHSS required a combination of screening activities sampling of soils sediments and surface water and well installation and sampling Table 1 1A is a matrix showing the IAG required tasks and how these tasks were implemented as defined in the OU 5 Work Plan as amended by the TMs Table 1 1B is a matrix showing TM15 required tasks and Document Modification Requests (DMRs) to the FSP

Stage 1 activities at each IHSS consisted primarily of the review of existing data, such as the results of previous investigations aerial photographs and other historical documents Stage 2 activities were screening activities that included radiological geophysical and soil gas surveys Sampling of surface and subsurface soils were the predominant Stage 3 activities and Stage 4 activities were primarily associated with groundwater investigations If other activities were to be performed that did not fall into Stages 1 to 4 these activities were conducted under Stage 5 The site specific FSPs outlined in the OU 5 Work Plan are briefly summarized below

<u>IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)</u> Review and screening activities specified for the Original Landfill including the area of IHSS 196 consisted of a review of a gamma radiation survey completed in 1990 review of aerial photographs and completion of a soil gas survey and geophysical surveys Sampling identified included surface soil sampling subsurface soil sampling in borings and sediment and surface water sampling adjacent to the IHSS The OU 5 Work Plan also specified that cone penetrometer testing (CPT) and Bengt Arne Tortensson (BAT®) sampling be performed and wells be installed and sampled downgradient of the IHSS and in selected soil borings if plumes were encountered Additionally pipes protruding from the landfill were to be investigated and if present effluent sampled The OU 5 Work Plan specified that TMs be prepared to present site specific FSPs for the soil gas survey geophysical surveys surface soil sampling CPT and monitoring well installation and sampling

IHSS 133.1 6 (Ash Pits 1 4, Incinerator, and Concrete Wash Pad) Tasks specified by the FSP for the IHSS 133 sites included a review of aerial photographs and radiological and geophysical surveys to identify the extent of these IHSS sites Sampling activities specified included surface soil sampling subsurface soil sampling in borings and installation and sampling of wells The preparation of TMs was specified for the geophysical surveys surface soil sampling subsurface soil sampling and monitoring well installation and sampling

IHSS 142 (C Ponds) Activities specified by the FSP for IHSS 142 10 (C 1 Pond) and IHSS 142 11 (C 2 Pond) included a review of existing data collected by ongoing monitoring activities to assess potential overlap between the ongoing programs and the proposed OU 5 specific program Contingent upon the results of the review of ongoing monitoring programs the FSP also specified that surface water and sediment samples be collected from the ponds Woman Creek and the SID In addition monitoring wells were to be installed and sampled downgradient of each pond

IHSS 209 (Surface Disturbance Southeast of Building 881), the Surface Disturbance West of IHSS 209, and the Surface Disturbance South of the Ash Pits Screening activities to be conducted at these sites included reviews of historical use information pertaining to these sites visual inspections and radiological surveys Sampling activities specified by the FSP included surface soil sampling from the excavations present at each site subsurface soil sampling from borings and collection of sediment and/or surface water samples from each of the former pond areas at IHSS 209

The FSP defined in the OU 5 Work Plan was amended by ten TMs at various stages during the field investigation As is discussed in detail below the scope of each TM does not agree in all cases with that described in the Work Plan Because some of the activities to be described in the TMs specified by the Work Plan were similar a single TM to address the same activity at more than one IHSS was prepared rather than preparing individual TMs for each IHSS In addition during the course of investigating each IHSS it became apparent that the scope of subsequent Work Plan activities was not appropriate or adequate thus necessitating the preparation of additional TMs Similarly the scope of several field investigation activities was clarified in letters submitted to EPA and CDPHE prior to implementing these activities These letters were prepared for activities where the Work Plan did not require a TM but additional definition or clarification of the scope of the activity was necessary The scope of each TM and letter prepared during the implementation of the Phase I RFI/RI is summarized below

### 1 4 2 Addenda to the Phase I RFI/RI Work Plan

#### 1 4 2 1 Technical Memorandum 1 Revised Network Design (Surface Water and Sediment)

TM1 (DOE 1993b) documented the results of the review and assessment of ongoing surface water and sediment monitoring programs discussed under IHSS 142 above Based upon this assessment of the ongoing programs this TM provided an amended FSP for the collection and analysis of surface water and sediment samples from the C 1 and C 2 Ponds Woman Creek and its tributaries and the SID In addition to addressing sampling activities for the ponds this TM also addressed surface water and sediment sampling activities for all other OU 5 IHSSs This TM also specified the installation of shallow well points along Woman Creek to augment ongoing groundwater/surface water interaction studies The sampling and monitoring programs defined by this TM are summarized in Section 2 2 3 3

#### 1 4 2 2 Technical Memorandum 2 Surface Geophysical Surveys (Original Landfill and Ash Pits)

TM2 (DOE 1992b) described the approach for performing magnetic and electromagnetic (EM) surveys at IHSS 115 and the IHSS 133 sites Due to similarities in these surveys at both IHSSs one TM was prepared to describe these surveys rather than the two TMs identified in the Work Plan This TM documented the results of the review of the 1990 radiological survey of IHSS 115 and reviews of existing information including aerial photographs for both IHSS 115 and the IHSS 133 sites It also provided the details of the procedures to be followed for performing geophysical surveys at both IHSSs The methodology for and results of these surveys are summarized in Sections 2 2 1 2 and 2 2 2 2

#### 1 4 2 3 Technical Memorandum 3 Surface-Soil Sampling Plan (Original Landfill)

TM3 (DOE 1993c) presented the sampling and analytical program for surface soils within IHSS 115 The sampling and analytical program defined in this TM consisted of collection of samples for analysis of radionuclides from anomalies identified by the 1990 radiological survey of IHSS 115 and collection of samples for analyses of chemicals and radionuclides from the disturbed area east of the landfill and from landfill cover material The surface soil sampling program is summarized in Section 2 2 1 3

### 1 4 2 4 Technical Memorandum 4 Surface Soil Sampling (Ash Pits Incinerator and Concrete Wash Pad)

TM4 (DOE 1993d) specified the sampling and analytical program for surface soils within the IHSS 133 sites Similar to the program defined by TM3 for IHSS 115 the program defined by this TM included sample collection for analysis of radionuclides from anomalies identified by a radiological survey of these sites conducted as part of the OU 5 RFI/RI (see Section 2 5 2) It also involved sample collections for analyses of chemicals and radionuclides from areas believed to have been impacted by disposal operations at the IHSS 133 sites Section 2 2 2 3 summarizes the methodology and results of this sampling program

### 1 4 2 5 Technical Memorandum 5 Soil Gas Survey (Original Landfill)

Based on the results of other soil gas surveys conducted at the site and on the review of historical data and other screening activities at IHSS 115 it was determined that modification of the soil gas sampling plan proposed in the OU 5 Work Plan was necessary TM5 (DOE 1993e) presented the results of the previous investigations at IHSS 115 and provided a revised sampling and analysis plan for the soil gas survey The results of this survey are summarized in Section 2 2 1 2

### 1 4 2 6 Technical Memorandum 6 Cone Penetrometer Testing (Original Landfill)

The OU 5 Work Plan proposed the performance of CPT and collection of groundwater samples with a BAT® (or equivalent) sampling device The Work Plan specified that a TM be prepared that would define the specific procedures and locations for these activities TM6 (DOE 1993f) specified the procedures and locations for CPT and provided a methodology for selecting locations for collection of groundwater samples contingent upon the results of the CPT and other previous and ongoing investigations at IHSS 115 Due to several advantages of this technique this TM also specified the collection of groundwater samples from well points rather than with the BAT® sampling device The implementation and results of these activities are summarized in Section 2 2 1 4

### 1 4 2 7 Technical Memorandum 7 Soil Borehole Sampling (Ash Pits Incinerator and Concrete Wash Pad)

Soil borings to be drilled in the areas of the IHSS 133 sites were proposed by the OU 5 Work Plan. The Work Plan also specified that a TM be prepared to better define the locations of these borings based on the results of preceding investigations TM7 (DOE 1993g) provided an FSP for the drilling and sampling of borings at the IHSS 133 sites It also specified the collection of groundwater samples from within borings using the Hydropunch II or BAT® samplers where groundwater was present. The soil boring program and its results are summarized in Section 2 2 2 3

### 1 4 2 8 Technical Memorandum 8 Groundwater Monitoring Well Installation (Original Landfill)

This TM provided a revised FSP for the installation and sampling of monitoring wells in the vicinity of IHSS 115 and IHSS 196 as prescribed by the OU 5 Work Plan Subsequent to the preparation of the draft version of this TM it was determined that the intent of the Work Plan was such that a TM was no longer required to define the locations of these monitoring wells Therefore a letter was prepared that described the plan for installing and sampling monitoring wells at IHSS 115 This letter is found in the appendices to TM15 (DOE 1994a) The groundwater monitoring program is summarized in Section 2 2 1 4

### 1 4 2 9 Technical Memorandum 9 Groundwater Monitoring Well Installation (Ash Pits Incinerator and Concrete Wash Pad)

The installation of monitoring wells in the area of the IHSS 133 sites was proposed in the OU 5 Work Plan and the Work Plan specified that a TM be prepared to define the locations of these wells TM9 (DOE 1993h) provided a monitoring well installation and sampling program for the installation of wells based on the results of previous investigations in the IHSS 133 area. The implementation of this TM and the results of this investigation are summarized in Section 2 2 2 4

### 1 4 2 10 Technical Memorandum 10 Surface Soil and Soil Borehole Sampling (IHSS 209 and Other Surface Disturbances)

TM10 (DOE 1993i) presented a FSP for the collection of surface and subsurface soils at IHSS 209 the Surface Disturbance West of IHSS 209 and the Surface Disturbance South of the Ash Pits The OU 5 Work Plan did not indicate that a TM would be required for these sampling programs but information obtained in previous stages of the investigation of these areas necessitated that the soil sampling program described in the Work Plan be modified This information indicated that there was no evidence of waste disposal in these areas and the soil sampling programs were reduced in scope so as to only confirm the results of the preceding investigations The results of the implementation of TM10 are summarized in Section 2 2 4 3

### 1 4 2 11 Technical Memorandum 11 Chemicals of Concern

TM11 (DOE 1995a) identified the chemicals of concern (COCs) that were included in the HHRA to assess potential health risks from assumed exposure to the COCs detected in soil groundwater and other media sampled in OU 5 COCs are metals or radionuclides whose concentrations exceed background concentrations (or organic chemicals that are not naturally occurring) but that could pose a health risk under the assumed exposure conditions COCs are selected from all analytes detected in each medium using risk based and other screening methods that identify chemicals that would pose the greatest risk and therefore warrant inclusion in the HHRA COCs also provide the focus for fate and transport modeling and remedy selection Section 4 2 provides a discussion of the comparison of data for OU 5 sampling locations with background values and Section 6 2 discusses the selection of COCs

### 1 4 2 12 Technical Memorandum 12 Exposure Scenarios

TM 12 (DOE 1995b) was prepared to identify potentially complete exposure pathways and human receptors at OU 5 and if presents quantitative values for exposure parameters and equations for estimating central tendency (CT) and reasonable maximum exposures (RMEs) to be used in the HHRA The scenarios identified in TM12 are discussed in detail in Section 6 3

#### 1 4 2 13 Technical Memorandum 13 Model Description

Fate and transport modeling was required to support the HHRA and the evaluation of potential remedial alternatives for the Feasibility Study (FS) at OU 5 TM13 (DOE 1994b) provided a description of the models selected to perform groundwater surface water and air modeling for OU 5 A Conceptual Site Model (CSM) of chemical release and transport to potential human receptorswas presented in TM13 This CSM identifies the rationale for the selection of mathematical models that were used to estimate exposure point concentrations for the HHRA The model selection process is summarized and the model results are detailed in Section 5 0

#### 1 4 2 14 Technical Memorandum 14 Toxicity

The OU 5 Work Plan also specified that a TM be prepared that identifies the toxicological information that would be used in the risk assessment. During the course of performing the OU 5 HHRA however it was determined that all necessary toxicological information for the identified COCs was available in the regulatory databases Therefore DOE EPA and CDPHE agreed that this TM would not be required.

#### 1 4 2 15 Technical Memorandum 15 Amended Field Sampling Plan

Subsequent to completion of the field program specified in the OU 5 Work Plan, it was determined that additional data were required to fully describe the nature and extent of contamination associated with all of the OU 5 IHSSs and to provide the information necessary for the evaluation of potential remedial alternatives in the OU 5 FS Rather than proceeding with a Phase II RFI/RI (as is the traditional approach outlined in the IAG) DOE EPA and CDPHE agreed to performing an additional stage of field investigations under the Phase I RFI/RI Therefore TM15 (DOE 1994a) was prepared to present the results obtained during the implementation of the OU 5 Work Plan identify gaps in the data obtained during the Work Plan investigation and to provide an amended Phase I FSP for obtaining the information necessary to fill those gaps

## 1 5 REPORT ORGANIZATION

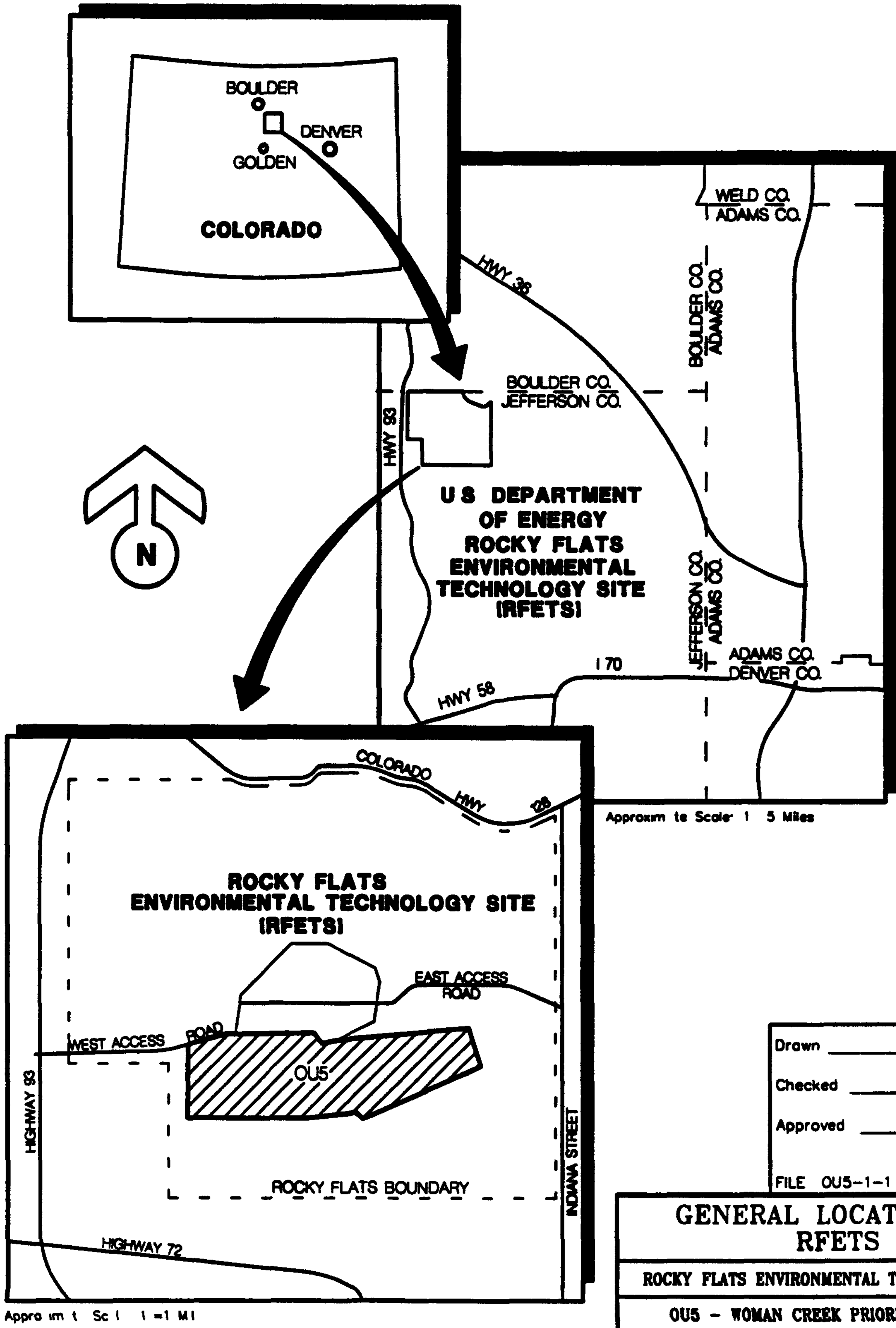
The following chapters of this report describe the field investigations performed at OU 5 and the results of those investigations provide a description of the nature and extent of contamination associated with each IHSS and to discuss the risk to human health and the environment posed by contamination at each IHSS Chapter 2 0 describes the stages of field investigation at each IHSS and presents the results of these investigations Those stages of the field investigation that were completed prior to the preparation of TM15 are only summarized in this report Detailed discussions of these investigations are presented in TM15 (DOE 1994a) The implementation of TM15 and the results of those activities are presented in detail for each IHSS in Chapter 2 0

Chapters 3 0 and 4 0 present discussions of the physical characteristics and nature and extent of contamination respectively at each IHSS These chapters draw information from all stages of the Phase I RFI/RI as well as information collected by other the site programs to provide a description of the physical setting and nature and extent of contamination at each IHSS This information is used to develop a conceptual understanding of the contamination associated with each IHSS and the potential for contaminant release and subsequent exposure to human receptors and/or the environment.

Chapter 5 0 discusses the results of contaminant fate and transport modeling in groundwater surfacewater and air This chapter provides a detailed discussion of the modeling process in each medium and of the results of the modeling particularly where applicable to the Baseline Risk Assessment (BRA) Chapters 6 0 and 7 0 provide discussions of the BRA The HHRA is discussed in detail in Chapter 6 0 and the Environmental Risk Assessment (ERA) is discussed in Chapter 7 0

A discussion of the process to be used for the evaluation of remedial alternatives is provided in Chapter 8 0 However presentation of the evaluation of remedial alternatives will be completed under the CMS/FS process Chapter 9 0 discusses the preliminary identification of data gaps and Chapter 10 0 provides a summary and conclusions of the Phase I RFI/RI

Appendix A the Hydrologic Data Summary Report, provides a detailed evaluation of surface water stream sediment pond sediment and groundwater data obtained from the sitewide and historical programs discussed in Section 1 2 3 and the data for these media obtained from the OU 5 Phase I RFI/RI This appendix was issued under separate cover previously The remaining Appendices B through N provide supporting data for the discussions provided in Chapters 2 0 through 7 0




Drawn NM 8/1/95 Date

Checked [handwritten initials] 8/1/95 Date

Approved Date

FILE OU5-1-1 DWG

# GENERAL LOCATION OF RFETS

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 1-1

## TABLE 1 1A MATRIX OF OU5 RFI/RI FSP REQUIREMENTS FROM IAG WORK PLAN AND TECHNICAL MEMORANDA

| IHSS | ACTIVITY | IAG | | WORK PLAN | | MODIFIED BY TM | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | TASK | Analytes (1) | TASK | Analytes ( ) | TASK | Aanlytes ( ) | |
| 115 Original Landfill (OLF) | Rad Survey | FIDLER | N/A | HPGe Fall 90 | N/A | Data reviewed in TM 2 FIDLER SURVEY over hot spots | N/A | |
| | Magnetometer | Not addressed | N/A | 2490 points | N/A | Data reviewed in TM 2 | N/A | |
| | I M Survey | Not addressed | N/A | 2490 points | N/A | Data reviewed in TM 2 | N/A | |
| | Soil Gas (SG) Survey | Over OLF | Not addressed | Not Determined | 28 33 | TM 4 343 samples 10% resampled for a maximum of 27 | 28 33 | |
| | Surficial Soil | Not addressed | Not addressed | 2 per Rad Anomaly in OLF | **Random** 1-4 8 11 12x 21 **Rad Anomalies** 1-4 | TM 3 Min 11 locations @ Hot Spots 3 Locations east of OLF & 51 Locations over OLF | Hot Spots 1 7 East of OLF 1 8 8y 11 16 21 over OLF 1 4 6 8 11 17 21 | A total of 67 samples were collected along with 5 dups for a total of 72 |
| | Soil Cores | 1 per/50 SGS pts | Not addressed | 1/15 SG Sam | not addressed | TM 5 Deleted p ogram | N/A | |
| | Soil Borings | If (+) SG results drill soil borings at locations which may have GW | 1-4 8 9 11 14 | 3 per SG plume 1 at each of 2 ponds 6 Distrubed Area | **2 FT Grab** 9 **6Ft** 1-4 11 12x **SG Borings** 9 12x | In Monitoring Well File | N/A | TM 8 Canceled/Replaced by two letters which specify number and location of samples |
| | Monitoring Wells | If GW is found in Soil Borings | 1-4 6 7 8y 10 11x | 3 wells | 1 2 2x 3 3x 4 4x, 6x 7x 8 8y 9 11 36 38 | In Monitoring Well File | Not addressed see Work Plan | TM 8 Canceled/Replaced |
| | Alluvial Wells | 3 Wells | 2 2x, 3 3x, 6x 7 8y 10 11x, 37 | 4 wells | 1 2 2x, 3 3x, 4 4x, 6x 7x 8 8y 9 11 36, 38 | 6 wells | Not addressed see Work Plan | |
| | Pipe Outfall | If water then sample quarterly | 2 2x 3 3x 6x 7 8y 10 11x, 37 | 1 Sample from both pipes | 1-4 1x-4x 6x 7x 8 8y 9 10 12x 36 38 | Not addressed | N/A | |
| | Cone Penetrometer Testing (CPT) | Not addressed | n/a | To be determined in TM 6 | N/A | TM 6 22 CPT points 15 well points GW samples taken from well points | **Ground Water** 1 7 10 12 18 27 | BAT® Sampling replaced by Well Points |

(1) See Page 6 for key to codes

## TABLE 1 1A MATRIX OF OU5 RFI/RI FSP REQUIREMENTS FROM IAG, WORK PLAN, AND TECHNICAL MEMORANDA

| IHSS | ACTIVITY | IAG | | WORK PLAN | | MODIFIED BY TM | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | TASK | Analytes (1) | TASK | Analytes ( ) | TASK | Aanlytes ( ) | |
| 133 1<br>133 6<br><br>Ash Pits Incinerator and Concrete Wash Pad | Rad Survey | FIDLER | N/A | HPGe Survey | N/A | Reviewed in TM 2 FIDLER Survey over Hot Spots | N/A | Work Plan 100 / HPGe |
| | Soil Borings | Does not specify | 1 2 | Estimated 85 Soil Borings | 1-4 8 | TM 7 46 Total 28 Loc with exploratory boreholes | 1 4 8 | Coverage17 Exploratory Boreholes and 1 HPGe Anomaly completed |
| | Groundwater sampled from Soil Borings if water encountered | Not addressed | N/A | | N/A | TM 7 Maximum of 10 samples | 1 4 8 | Field Parameters pH sc D O Barometric Pressure |
| | Magnetometer | Not addressed | N/A | 4864 points | N/A | Reviewed in TM 2 | N/A | |
| | EM Survey | Not addressed | N/A | 4864 points | N/A | Reviewed in TM 2 | N/A | |
| | Surficial Soil | At hot spots | 1 2 | To be determined | **Random** 1-4 8 21<br>**Rad Anomalies** 1-4 | TM 4 20 samples 8 previously sampled for environmental evaluation | 1 4 8 21 | |
| | Alluvial GW Wells | 3 Locations | 2 2x 3 3x 6x 7 8y 10 11x | 3 Locations | 1 4 1x-4x 6x 7x 8 9 11 | TM 9 4 Locations | **Soil Samples** 1 4 8<br>**GW Samples** 1 2 8 | **Field Measurements** pH S C Temp D O Bar Pressure |

(1) See Page 6 for key to codes

## TABLE 1 1A MATRIX OF OU5 RFI/RI FSP REQUIREMENTS FROM IAG WORK PLAN AND TECHNICAL MEMORANDA

| IHSS | ACTIVITY | IAG | | WORK PLAN | | MODIFIED BY TM | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | TASK | Analytes (1) | TASK | Analytes (1) | TASK | Aanlytes (1) | |
| 142 10 11 C 1 and C 2 Ponds | Pond Surface Water | 5 Locations at each pond | 1 7 1x-4x 6 6x, 7x 8y 8z,10 11x 38 | 5 Locations at each pond | 1-4 1x-4x 5 6 7x 8 8y 9 11 38 | TM 1 C 1 Field Parameters no field work in Pond C 2 | **Field Parameters** Temp S C pH D O | NPDES data used for characterization of both ponds |
| | Pond Sediment | 5 Locations at each pond | 1 7 8y 10 11 38 | 5 Locations at each pond | 1 5 8 9 11 12x 38 | TM 1 3 Locations in each pond | 5 8 9 11 37 38 | These analyses only apply to th top 6 Note the maximum amount of sediment sampled was less than 6 |
| | GW Wells | 4 Wells | 1-4 1x-4x 5 6 6x 7 7x 8y 10 11x 38 | Min of 4 | 1 5 1x 4x 6x 7x 8 8y 9 11 37 38 | Not addr ss d | N/A | |

(1) See Page 6 for key to codes

## TABLE 1 1A MATRIX OF OU5 RFI/RI FSP REQUIREMENTS FROM IAG WORK PLAN AND TECHNICAL MEMORANDA

| IHSS | ACTIVITY | IAG | | WORK PLAN | | MODIFIED BY TM | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | TASK | Analytes (1) | TASK | Analytes (1) | TASK | Aanlytes (1) | |
| 209 Surface Disturbances | Rad Survey | Not addressed | N/A | FIDLFR Survey | N/A | Not addressed | N/A | |
| | Sediment Sample in former ponds | Not Addressed | N/A | 1 Location in each pond | 1 4 8 9 11 12x | Not addressed | N/A | |
| | SW if present in former ponds | Not addressed | N/A | 1 Location in each pond | 1 4 8 9 11 | Not addressed | N/A | |
| | Surface Soil | Not addressed | N/A | 19 Locations | 1 4 8 9 11 21 | TM 10 19 Locations | 2 4 8 11 12x 13 15 17 21 | |
| | Boreholes | Not addressed | N/A | 19 Boreholes | **2 ft Intervals** 9 **6 ft intervals** 1 4 8 9 11 21 | TM 10 4 Boreholes | **2 ft Intervals** 9 **6 ft intervals** 1 4 8 9 11 | |
| | Soil in Small Depressions | Not addressed | N/A | Not determined | 1 4 8 9 11 12x 21 | TM 10 | N/A | Include with Surface Soil Sampling in TM 10 |

(1) See Page 6 for key to codes

**TABLE 1 1A MATRIX OF OU5 RFI/RI FSP REQUIREMENTS FROM IAG, WORK PLAN, AND TECHNICAL MEMORANDA**

| IHSS | ACTIVITY | IAG | | WORK PLAN | | MODIFIED BY TM | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | TASK | Analytes (1) | TASK | Analytes (1) | TASK | Aanlytes (1) | |
| Stream Sampling Program | | | | | | | | |
| 115 | Stream SW | Not Determined | 2 2x 3 3x 6x, 7 8y 10 11x 37 | 6 Locations | 1-4 1x-4x, 6x 7x 8 8y 9 11 12x 36 | see TM 1 below | N/A | TM 1 specifies 4 synoptic |
| | Stream Sed | Not Determined | 2 3 8y 6 7,10,11x, 37 | 4 Locations | 1-4 8 9 11 12x | see TM 1 below | N/A | |
| 133 | Seds Down stream of Ash Pits | Not Addressed | N/A | | 1 5 8 21 38 | see TM 1 below | N/A | |
| 142 | | 28 Locations | 1 7 8y 10 11x 38 | 12 Locations, and 18 from Site Wide | 1 5 8 21 38 | see TM 1 below | N/A | |
| TM 1 for all OU5 | Stream Surface Water | N/A | N/A | N/A | N/A | 14 Locations per TM 1 9 for storm e ents | 1-4 2x-4x 6x 7x 8 8x 9 11 12x 36 39 | |
| | | | | | | | 9 11 12x | These analytes for base flow events only |
| | | | | | | | 39 (Microtoxicity) | SW040 SW041 SW50193 SW50293 SW033 SW034 SW026, SW027 |
| | Stream Sediments | N/A | N/A | N/A | N/A | 9 Locations per TM1 | 1-4 8 21 38 | All Locations |
| | | | | | | | 5 | SW027 SW024 Only |
| | | | | | | | 39 | Only Analyte collected at SED501 505 &506 |

(1) See Page 6 for key to codes

## TABLE 1 1A MATRIX OF OU5 RFI/RI FSP REQUIREMENTS FROM IAG, WORK PLAN AND TECHNICAL MEMORANDA

| ANALYTE | Code | ANALYTE | Code |
|---|---|---|---|
| Gross A/B | 1 | COD | 22 |
| Filtered A/B | 1x | Orthophosphate | 23 |
| U 233/234/235/238 | 2 | $NO_3/No_2$ as N | 24 |
| Dissolved U 233/234/235/238 | 2x | Ra 226/228 | 25 |
| Plutonium 239/240 | 3 | TDS Cl $SO_4$ $CO_3$ $HCO_3$ | 26 |
| Dissolved Plutonium 239/240 | 3x | Cyanid | 27 |
| Americium 241 | 4 | 1,1,1 Trichloroethan (TCA) | 28 |
| Dissolved Americium 241 | 4x | Dichloromethane | 29 |
| Tritium | 5 | Benzene | 30 |
| Cesium 137 | 6 | Carbon Tetrachloride (CCl ) | 31 |
| Dissolved Cesium 137 | 6x | Tetrachloroethene (PCE) | 32 |
| Strontium | 7 | Trichloroethene (TCE) | 33 |
| Dissolved Strontium | 7x | Dissolved Anions TDS | 36 |
| TAL Metals | 8 | Chromium | 37 |
| Dissolved TAL Metals | 8x | Nitrate | 38 |
| HSL Metals | 8y | Micro/Acute Toxicity | 39 |
| Dissolved HSL Metals | 8z | | |
| TCL Volatiles | 9 | | |
| HSL Volatiles | 10 | | |
| TCL Semivolatiles | 11 | | |
| HSL Semivolatiles | 11x | | |
| TCL Pesticides PCB s | 12 | | |
| TCL Pesticides | 12x | | |
| Bulk Density | 13 | | |
| Particle Size Analysis | 14 | | |
| Specific Conductance | 15 | | |
| Carbonate | 16 | | |
| pH | 17 | | |
| CLP Metals w/ Cs, Li, Sn, Mo Si | 18 | | |
| BNA | 19 | | |
| TSS | 20 | | |
| TOC | 21 | | |

## TABLE 1 1B MATRIX OF OU5 FSP REQUIREMENTS FROM TM15

| ORIGINAL SCOPE OF TM15 WORK PLAN AUGUST 1994 | 94 DMR(1) ERM 0139 11/10/94 DEEP BEDROCK WELL LOCATIONS REVISED GEOTECHNICAL PROGRAM AND IHSS133 DRILLING | 94 DMR(1) ERM 0144 12/16/94 TEMPORARY FILL ROAD | 94 DMR(1) ERM 0146 12/21/94 TRIP BLANK QA/QC REQUIREMENTS | 94 DMR(1) ERM 0148 12/20/94 CONVERT GEOTECH BORINGS TO DEEP MONITORING WELL |
|---|---|---|---|---|
| **GEOTECHNICAL PROGRAM. IHSS 115**<br>5 HSA BOREHOLES (one with a piezometer installed) 8 Kansas Sampler Boreholes (one with a piezometer installed) two piezometers to be checked for water levels monthly | 19 HSA BOREHOLES (up to 9 piezometers/monitoring wells installed) Addressed changes to the geotechnical sample parameters to be collected | Addressed access to boring locations by constructing a temporary fill road into IHSS 115 | Addressed trip blank QC requirement of one VOC trip blank per groundwater VOC collection per day | Addressed EPA *concerns* regarding UHSU and LHSU interaction in the area of the former ponds (IHSS 196) Location also selected to evaluate possible inferred fault zone |
| Install 3 deep bedrock monitoring wells at locations to be specified in a future letter | Piezometers/monitoring wells to have water levels checked monthly and sampled quarterly for one year for TCL VOCs SVOC Pesticides and PCBs TAL metals and radionuclides | | | Converted the geotechnical b r ng to be located in the area of the *former ponds into a deep bedrock* monitoring well and revised the workplan to allow construction of a shallow UHSU well adjacent to the LHSU well<br>The UHSU well *to be constructed* within a second geotechnical boring drilled in the area due to the historical landslide present and the *need for* additional geotechnical data |

# TABLE 1 1B MATRIX OF OU5 FSP REQUIREMENTS FROM TM15

| ORIGINAL SCOPE OF TM15 WORK PLAN AUGUST 1994 | 95 DMR(1) ERM-0015 2/7/95 MODIFY GEOTECH LOCATIONS CONVERT GEOTECH BORINGS TO DEEP WELL/IHSS 209 SOIL SAMPLING | 95 DMR(1) ERM 0022 2/10/95 ADD ONE SHALLOW LHSU WELL IN IHSS 115 | 95 DMR(1) ERM 0151 4/5/95 DELETE PESTICIDES AND PCBs FROM GROUNDWATER ANALYTE LIST | TM15 WORK COMPLETED |
|---|---|---|---|---|
| **GEOTECHNICAL PROGRAM. IHSS 115**<br>5 HSA BOREHOLES (one with a piezometer installed) 8 Kansas Sampler Boreholes (one with a piezometer installed) two piezometers to be checked for water levels monthly<br><br>Install 3 deep bedrock monitoring wells at locations to be specified in a future letter | Address FS team proposed changes to remaining geotech boring locations Convert locations at western end of temporary fill road to a fifth deep bedrock monitoring well on the basis of the results of the LHSU well 71194<br>Location selected to evaluate possible inferred fault zone<br>Attempt to collect Shelby tube sample of slide plane at 4 ft in shallow UHSU well offset | Address upper water bearing interval observed in geotech/fifth deep well at west end of temp road also try and collect shelby tube sample of slide plane at 4 previous attempt did not succeed | | Completed 20 geotechnical borings 8 converted to monitoring wells and three for surface casings for three deep bedrock monitoring wells in IHSS 115 Completed the l cat o ı adjac ıt t IHSS 196 one UHSU well (59794) and one LHSU well (71194)<br>Loc t at west end of temporary fill road completed with one UHSU well (58394) and two LHSU wells (57194 deep LHSU and 71494 shallow LHSU) |

TABLE 1 1B MATRIX OF OU5 FSP REQUIREMENTS FROM TM15

| ORIGINAL SCOPE OF TM15 WORK PLAN AUGUST 1994 | 94 DMR(1) ERM 0139 11/10/94 DEEP BEDROCK WELL LOCATIONS REVISED GEOTECHNICAL PROGRAM AND IHSS133 DRILLING | 94 DMR(1) ERM 0144 12/16/94 TEMPORARY FILL ROAD | 94 DMR(1) ERM-0146 12/21/94 TRIP BLANK QA/QC REQUIREMENTS | 94 DMR(1) ERM 0148 12/20/94 CONVERT GEOTECH BORINGS TO DEEP MONITORING WELL |
|---|---|---|---|---|
| **GROUNDWATER INVESTIGATION, IHSS 115**<br>Install and sample 5 miniwells Sample quarterly for TCL VOC s SVOCs Pesticides and PCBs TAL metals and radionuclides<br><br>Measure 46 water levels monthly Sample existing well points/miniwells quarterly for TCL VOCs SVOCs Pesticides and PCBs TAL metals and radionuclides Installed three piezometers to characterize bedrock surface Perform one aquifer test | Three borehole/deep bedrock monitoring well locations are addressed Deep wells are to have water levels mon tored and water quality samples collected quarterly for one year for TCL VOCs SVOCs Pesticides and PCB s TAL metal and r dionuclides Locations selected as closure/ compliance monitoring points and to collect subsurface data for the evaluation of a possible inferred fault in IHSS 115 | | | |

**TABLE 1 1B MATRIX OF OU5 FSP REQUIREMENTS FROM TM15**

| ORIGINAL SCOPE OF TM15 WORK PLAN AUGUST 1994 | 95 DMR(1) ERM 0015 2/7/95 MODIFY GEOTECH LOCATIONS CONVERT GEOTECH BORINGS TO DEEP WELL/IHSS 209 SOIL SAMPLING | 95 DMR(1) ERM-0022 2/10/95 ADD ONE SHALLOW LHSU WELL IN IHSS 115 | 95 DMR(1) ERM 0151 4/5/95 DELETE PESTICIDES AND PCBs FROM GROUNDWATER ANALYTE LIST | TM15 WORK COMPLETED |
|---|---|---|---|---|
| **GROUNDWATER INVESTIGATION, IHSS 115**<br>Install and sample 5 miniwells Sample quarterly for TCL VOC s SVOCs Pesticides and PCBs TAL metals and radionuclides<br><br>Measure 46 water levels monthly Sample existing well points/miniwells quarterly for TCL VOCs SVOCs Pesticides and PCBs TAL metals and radionuclides Installed three piezometers to characterize bedrock surface Perform one aquifer test | Deleted tritium TOC and COD from groundwater analyte list | | Delete Pesticides and PCBs from Groundwater Analyte List to conform to OU5 Work Plan | Completed 3 LHSU bedrock monitoring wells converted three g otechnical borings t three LHSU wells installed 8 miniwells Completed first and second quarter groundwater sampling Collected No th ough Jun wat r l els |

## TABLE 1 1B MATRIX OF OU5 FSP REQUIREMENTS FROM TM15

| ORIGINAL SCOPE OF TM15 WORK PLAN AUGUST 1994 | 94 DMR(1) ERM 0139 11/10/94 DEEP BEDROCK WELL LOCATIONS REVISED GEOTECHNICAL PROGRAM AND IHSS133 DRILLING | 94 DMR(1) ERM 0144 12/16/94 TEMPORARY FILL ROAD | 94 DMR(1) ERM 0146 12/21/94 TRIP BLANK QA/QC REQUIREMENTS | 94 DMR(1) ERM 0148 12/20/94 CONVERT GEOTECH BORINGS TO DEEP MONITORING WELL |
|---|---|---|---|---|
| **ASH PITS, IHSS 133**<br>Additional work to characterize TDEM anomalies to be proposed in a future letter based on visual survey Seven Kansas Sampler soil borings collection of one groundwater sample from borehole (location to be determined) | Addressed collection of soil sample for solidification treatability study | | | |
| **GROUNDWATER INVESTIGATION, IHSS 133**<br>Install 9 miniwells Measure monthly water levels Sample piezometers quarterly for TAL metals SVOC Pesticides and PCB s and radionuclides Perform one aquifer test | | | | |
| **HPGe SURVEY, IHSS 209 AND OTHER SURFACE DIST.**<br>Perfrom HPGe survey perform FIDLER Survey collect surface soil samples on basis of FIDLER Survey results | | | | |

## TABLE 1 1B MATRIX OF OU5 FSP REQUIREMENTS FROM TM15

| ORIGINAL SCOPE OF TM15 WORK PLAN AUGUST 1994 | 95 DMR(1) ERM 0015 2/7/95 MODIFY GEOTECH LOCATIONS CONVERT GEOTECH BORINGS TO DEEP WELL/IHSS 209 SOIL SAMPLING | 95 DMR(1) ERM-0022 2/10/95 ADD ONE SHALLOW LHSU WELL IN IHSS 115 | 95 DMR(1) ERM-0151 4/5/95 DELETE PESTICIDES AND PCBs FROM GROUNDWATER ANALYTE LIST | TM15 WORK COMPLETED |
|---|---|---|---|---|
| **ASH PITS, IHSS 133**<br>Additional work to characterize TDEM anomalies to be proposed in a future letter based on visual survey Seven Kansas Sampler soil borings collection of one groundwater sample from borehole (location to be determined) | Addresses one additional boring in TDEM anomaly west side of IHSS 133 | | | Completed original 7 plus 3 Kansas Sampler borings two borings mislocated one converted to miniwell Two borings were drilled to replace mislocated borings Collected 25 real 6 rinse and 1 dup sample |
| **GROUNDWATER INVESTIGATION, IHSS 133**<br>Install 9 miniwells Measure monthly water levels Sample piezometers quarterly for TAL metals SVOC Pesticides and PCB s and radionuclides Perform one aquifer test | | | | Installed 9 miniwells completed 1st and 2nd quarter groundwater sampling collected Nov through June water levels collected 11 moisture content samples Collected rinse from 55594 f r analysis Did not collect a sample from 57894 |
| **HPGe SURVEY, IHSS 209 AND OTHER SURFACE DIST.**<br>Perfrom HPGe survey perform FIDLER Survey collect surface soil samples on basis of FIDLER Survey results | Provided results of HPGe and FIDLER Surveys Proposed 8 surface soil sample locations | | | Completed HPGe Survey of 24 points completed FIDLER survey of 24 points Collected 8 surface soil samples and 2 QC samples to verify HPGe and FIDLER survey results |

(1) DMR= Document Modification Request

# 2 0 OU 5 FIELD OPERATIONS AND INVESTIGATIONS

This chapter discusses the methods and results of the field investigations performed under the Phase I RFI/RI of OU 5 As discussed in Chapter 1 0 the performance and results of the field investigations outlined in the OU 5 Work Plan (DOE 1992a) are described in detail in TM15 (DOE 1994a) The FSP was implemented in stages (Figure 2 18) Historical Review Screening Level Surveys Intrusive Sampling and Well Installation and Groundwater Sampling These investigations are summarized briefly in this chapter

## 2 1 FIELD INVESTIGATION PROCEDURES

All field investigations conducted during the OU 5 Phase I RFI/RI were performed in accordance with the applicable RFETS Standard Operating Procedures (SOPs) More specifically the procedures followed are those contained in the following volumes of the Environmental Management Division Operating Procedures Manual (5 21000 OPS)

- Volume I Field Operations (5 21000 OPS FO) (EG&G 1992a)
- Volume II Groundwater (5 21000 OPS GW) (EG&G 1992b)
- Volume III Geotechnical (5 21000 OPS GT) (EG&G 1992c) and
- Volume IV Surface Water (5 21000 OPS SW) (EG&G 1992d)

During the course of this project several Document Modification Requests (DMRs formerly known as Document Change Notices (DCNs) were prepared to modify the existing procedures for specific application to the OU 5 sites

## 2 2 PHASE I RFI/RI FIELD INVESTIGATION

This section provides a summary of the work conducted during implementation of the FSP defined by the OU 5 Work Plan (DOE 1992a) and as amended by several TMs during various stages of the field investigation Work conducted prior to January 1994 is discussed in detail in TM15 (DOE 1994a) and a summary of that work is provided in this section Results of additional work proposed and outlined in TM15 are discussed in more detail herein The objectives of the Phase I RFI/RI were to

- Characterize the physical and hydrogeological setting of the IHSSs
- Assess the presence or absence of contamination at the IHSSs
- Characterize the nature and extent of contamination at the IHSSs if present
- Determine contamination migration rate and transport characteristics
- Support the Phase I Human and Environmental Risk Assessment, and
- Provide a basis for the Feasibility Study if required

Preliminary evaluation of data collected during the first phase of work consisted of comparisons with background upper tolerance limits (UTLs) presented in the BGCR (DOE 1993a) However those UTLs were calculated with outliers being excluded (see Appendix E of DOE 1993a) Comparisons with those UTLs were performed and documented in TM15 That step was an initial one and as the project has progressed the data cleanup process has evolved as have the evaluation processes Since the preliminary evaluations background UTLs have been recalculated without excluding outliers for both lognormal and normal distributions This was done so that site data and background data were treated similarly for the risk assessment Therefore calculated values of background UTLs have changed since TM15 was finalized which has resulted in comparisons of site data to two sets of background UTLs through time As a consequence this section is primarily a summary of the work completed and the analytical results of that work are discussed in general terms However where background UTLs are referenced in this section the values presented in Appendix C of the BGCR values are used Analytical data are discussed in additional detail in Chapter 4 0 Nature and Extent of Contamination

The discussions of analytical data provided in the following sections reference a series of tables (Tables 2 3 through 2 11) that summarize the data collected during all stages of this investigation The data presented in these tables were generally organized so that the data generated by the investigation specified by the OU 5 Work Plan (DOE 1992a) were provided for comparison to data generated by the investigation outlined in TM15 (DOE 1994a) As noted previously the value substituted for nondetects in those data sets with relatively high (>50%) non detect rates will strongly affect the calculated value of the apparent mean. Both the data analyst and the reader should keep in mind the uncertainty of statistical parameters calculated for any data set containing a high proportion of nondetect data In the case of TM15 those constituents (metals in particular) detected at relatively low to very low frequencies (<50% to <20% detects) tend to have mean concentrations that are artificially higher than those reported for pre TM15 data. This apparent increase in mean values is the result of higher values substituted for nondetects

In these cases the range of detected concentrations (reported in Tables 2 3 to 2 10) gives a better indication of the comparability of metal concentrations in TM15 and pre TM15 samples In these cases the range of detected concentrations reported on Tables 2 3 through 2 10 gave a better indication of whether the samples collected under TM15 contain similar concentrations to the pre TM15 samples

The data generated by the OU 5 Work Plan field investigation were used for the HHRA (Chapter 6 0) Therefore a comparison of the data generated under the TM15 investigation to the data used for the HHRA was necessary to evaluate any potential impacts to the conclusions of the HHRA that result from the collection of additional data A discussion of the potential impacts is provided in Section 2 3

### 2 2 1 IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)

Volume II of TM15 (DOE 1994a) provides detailed discussions of the methodology for and results of the Phase I investigation conducted at IHSSs 115 and 196 (IHSS 115/196) prior to implementation of work outlined in Volume I of TM15 (DOE 1994a) A summary of the information related to IHSS 115/196 and presented in Volume II of TM15 (DOE 1994a) is also presented in this section, along with a discussion of the results of implementation of the activities proposed in TM15 Figure 1 2 shows the relation of these IHSSs to RFETS Figure 2 1 is a larger scale map of the IHSS 115/196 area showing locations sampled prior to the implementation of TM15

#### 2 2 1 1 Stage 1

Stage 1 activities conducted for IHSS 115/196 included reviewing vertical aerial photographs from the Aerial Photographic Analysis Comparison Report (EPA 1988a) and a series of oblique aerial photographs obtained from the RFETS archives taken during the operation of the Original Landfill Review of these aerial photographs resulted in some modifications to the dimensions and boundaries of IHSS 115/196 shown in the OU 5 Work Plan These modifications are discussed in detail in TM15 (DOE 1994a) and the current boundaries are shown on Figure 2 1

Stage 1 also involved review of the results of a gamma radiation survey conducted from October 25 1990 through December 8 1990 The survey was conducted using a 20 percent N type high purity germanium (HPGe) detector (DOE 1992a) These activities are discussed in detail in Section 2 4 1 of Volume II of

TM15 (DOE 1994a) This investigation found that radiation in the soil was contributed from potassium uranium and thorium Review of these data indicated that activities from these radioisotopes were consistent with natural background activities However there were areas that exhibited elevated uranium 238 activity (hot spots) These hot spots were surveyed and marked with stakes for subsequent sampling activities (Section 2 2 1 3) and radiological surveys (Section 2 2 1 2)

### 2 2 1 2 Stage 2

Stage 2 activities at IHSS 115/196 consisted of geophysical and soil gas surveys as specified in the OU 5 Work Plan In addition a radiological survey with a Field Instrument for the Detection of Low Energy Radiation (FIDLER) was conducted to supplement the 1990 HPGe survey discussed in the previous section Section 2 4 2 of Volume II of TM15 (DOE 1994a) discusses the Stage 2 activities in detail and they are summarized in this section

Geophysical Surveys Frequency-domain EM and magnetometer geophysical surveys were conducted in IHSS 115/196 from October through December 1992 Results of these surveys confirmed the known location of the Original Landfill and did not identify additional areas requiring investigation Useful data could not be acquired beneath the power lines near the southern boundary of the Original Landfill due to the overriding EM interference produced by the lines

Soil Gas Survey A real time soil gas survey was performed at IHSS 115/196 as proposed by the OU 5 Work Plan The survey involved the collection and analysis of more than 300 soil gas samples Anomalous readings encountered during the survey were further investigated by additional soil gas sampling Plumes of volatile organic compounds (VOCs) identified by the soil gas survey were further assessed by the subsequent drilling of boreholes within the plumes and installation of groundwater monitoring wells downgradient of the plumes (Section 2 2 1 3) Results of the soil gas survey are discussed in detail in Section 2 4 2 2 of Volume II of TM15 (DOE 1994a) Briefly the survey resulted in the identification of three areas of anomalous concentrations of 1 1 1 TCA TCE and PCE as shown on Figure 2 2

In July 1993 (subsequent to completion of the soil gas survey) a small scale intrinsic air permeability study was conducted in and adjacent to IHSS 115/196 Evaluation of results of the intrinsic air permeability study are presented in Section 2 2 1 7

FIDLER Surveys Several areas of IHSS 115/196 were surveyed with a FIDLER during March to June 1993 The purpose of this survey was to further characterize anomalies identified by the 1990 HPGe survey discussed in Section 2 2 1 1 Section 2 4 2 3 of Volume II of TM15 (DOE 1994a) details the performance and results of this survev

The FIDLER surveys identified nine areas of anomalous radioactivity Each of these areas has been posted as a radiologically controlled area (RCA) In areas where a piece of landfilled material was not identified as the source of the detected radiation surface soil samples were collected to characterize the contamination present Several pieces of radioactive material were removed from these areas on May 28 1993 during an emergency removal action This material was placed in an area designated for the storage of radioactive material Measurements performed by EG&G Radiological Engineering indicated that the principal isotope present in these materials was uranium 238 although no quantification of the activity present was provided

### 2 2 1 3 Stage 3

Stage 3 activities at IHSS 115/196 consisted of the collection and analysis of surface soil samples drilling and sampling characterization boreholes and further investigation of the soil gas anomalies The results of Stage 3 activities are discussed in detail in Section 2 4 3 of Volume II of TM15 (DOE 1994a) and are summarized in this section

Surface Soil Sampling Details of surface soil sampling at IHSS 115/196 are presented in Section 2 4 3 1 of Volume II of TM15 (DOE 1994a) Surface soil samples were collected at 66 locations in IHSS 115/196 (Figure 2 3) Analyses of surface soil samples identified samples with elevated concentrations of a limited number of metals and several radionuclides were identified with activities that exceeded background activities Pesticides polychlorinated biphenyls (PCBs) and a wide variety of semi volatile organic compounds (SVOCs) were also detected in several surface soil samples Locations where the concentrations of both inorganic and organic compounds exceeding background concentrations were detected are centered around the abandoned storm sewer outfall near the center of the Original Landfill These findings may be the result of the surface soil being disturbed during installation of the outfall pipe

Characterization Boreholes Eight boreholes were installed in IHSS 115/196 for subsurface characterization The results of this work are discussed in detail in Section 2 4 3 2 of Volume II of TM15 (DOE 1994a) Briefly metals analyses resulted in the detection of a limited number of metals at concentrations exceeding background UTLs Radiological analyses identified several samples from the upper six feet with activities greater than background Also a variety of SVOCs VOCs pesticides and PCBs were detected in samples from these boreholes

Investigation of Soil Gas Anomalies Four boreholes were installed within the soil gas anomalies located adjacent to the former ponds (IHSS 196) and two 0 5 inch diameter wells (small diameter wells) (60993 and 61093) were installed within the anomaly near the center of the Original Landfill Details of installation sampling and results of these activities are discussed in Section 2 4 3 3 of Volume II of TM15 (DOE 1994a)

Results of the analyses of the soil and groundwater samples collected from the boreholes and small diameter wells drilled within each soil gas anomaly confirmed the results of the soil gas survey In addition several metals and radionuclides were detected at concentrations exceeding background UTLs Some pesticides PCBs and SVOCs were detected at these soil gas anomaly locations

Surface Water and Sediment Sampling Results of surface water sampling are discussed in Section 2 2 3 3 because these sampling locations are all part of a single system

### 2 2 1 4 Stage 4

Stage 4 activities conducted at IHSS 115/196 consisted of a CPT program and the investigation of groundwater quality through the use of wellpoints and monitoring wells Implementation and results of these activities are discussed in detail in Section 2 4 4 of Volume II of TM15 (DOE 1994a) and are summarized in this section

Cone Penetrometer Testing Specifics of the proposed CPT program are provided in TM6 (DOE 1993f) TM6 was prepared based upon evaluation of work conducted during Stages 1 2 and 3 Section 2 4 4 1 of Volume II of TM15 (DOE 1994a) discusses the CPT program and its results in detail Five significant topographic lows in the bedrock surface (or migration pathways) were identified by the CPT program Water was found to be present in three of the topographic lows in the bedrock surface the other two topographic lows in the bedrock were dry Water was also found at two areas identified as topographic highs in the bedrock surface Information provided by CPT was used to subsequently locate wellpoints (Section 2 2 1 4) and monitoring wells (Section 2 2 1 4)

Wellpoints Ten wellpoints were installed along the downgradient perimeter of IHSS 115/196 and are discussed in Section 2 4 4 2 of Volume II of TM15 (DOE 1994a) Elevated concentrations of a few metals common anions radionuclides and water quality parameters were detected in unfiltered groundwater samples from within the footprint of the Original Landfill VOCs including acetone 1 1-dicholoroethene (1 1 DCE) 1 2 dichloroethene (1 2 DCE) 1 1 1 TCA TCE and PCE were also detected in these samples

Groundwater Investigation Details of five monitoring wells (59393 59493 59593 59793 and 61293) and two boreholes (59193 and 59293) installed as part of the groundwater investigation of IHSS 115/196 are provided in Section 2 4 4 3 of Volume II of TM15 (DOE 1994a) The two boreholes were drilled at locations originally intended for monitoring wells but groundwater was not encountered during drilling and the boreholes were plugged and abandoned

Several metals were detected in subsurface soil samples collected from these wells and boreholes at concentrations exceeding background UTLs Plutonium 239/240 was also detected at activities exceeding the background UTL The PCB Aroclor 1254 was detected in a subsurface soil sample from well 59493 which was installed within IHSS 196 A variety of SVOCs and VOCs were also detected in several subsurface soil samples from these wells and boreholes

Groundwater samples collected from these five wells have contained a number of metals at concentrations exceeding background UTLs A few radionuclides were also detected at activities exceeding background UTLs No pesticides or PCB constituents were detected in the groundwater samples collected in the IHSS 115/196 monitoring wells A variety of SVOCs have been detected in groundwater samples primarily those from well 59493 which was installed within IHSS 196 Also the VOC methylene chloride a common laboratory contaminant was detected in one sample from well 59493

Two of the five wells installed at IHSS 115/196 were selected for aquifer testing A multiple well pumping test was performed at IHSS 196 in well 59493 and a single well slug test was performed in one well (59593) downgradient of IHSS 115 The multiple well test appears to have been successful however the slug test data indicated that the results at that location may not be representative of the formation characteristics but may instead represent the hydraulic conductivity of the filter pack (see Section 2 4 4 3 of Volume II of TM15 (DOE 1994a) The slug test was repeated during the implementation of TM15 (DOE 1994a) Six of the wells installed in IHSS 115/196 during the implementation of TM15 were tested as part of the 1995 Aquifer Testing Program (EG&G 1995i) The results are discussed in Sections 2 2 1 7and 3 8 1

### 2 2 1 5 Stage 5 Investigation of Storm Sewer Pipelines

Stage 5 activities at IHSS 115/196 involved investigation of the storm sewer pipelines that protrude from the Original Landfill area. These activities are discussed in detail in Section 2 4 5 of Volume II of TM15 (DOE 1994a) and are summarized below

Activities performed to investigate the storm sewer pipelines included collecting a one time sample of the water discharging from the active pipeline and performing a video-camera survey of the storm sewer system to determine and/or verify the connections and source of the constant discharge from the system.

Analytical results of the single sample obtained during dry weather from the storm sewer outfall did not indicate elevated concentrations for radionuclides metals or organic constituents

The video camera survey of the pipeline indicated that, for the most part, the storm sewer system had only small rocks and sediment along its invert There were some slight groundwater inflows at joints and manholes and an occasional 6 inch polyvinyl chloride (PVC) roof drain connection entering through the top portion of the pipe However a continuous dry weather discharge was seen entering the system through a 12 inch corrugated metal pipe (CMP) at a manhole from the Building 447 foundation underdrain system (Jacobs 1994) Another manhole had an intermittent high velocity inflow that entered the manhole through a 6 inch PVC pipe located at the southeast corner of the manhole This inflow appeared to be pumped into the manhole from a sump pump Based on the location of the pipe the flow was assumed to be coming from Building 440 or the evaporative cooling tower located along the west side of Building 440

### 2 2 1 6 Ambient Air Monitoring

Data from the monitoring network known as the Radioactive Ambient Air Monitoring Program (RAAMP) and from three samplers installed specifically to monitor ambient radionuclide levels around OU 5 were analyzed to evaluate whether airborne releases are significant from IHSS 115/196 Information collected by health and safety (H&S) personnel during the implementation of field investigations was also reviewed Section 2 5 5 of Volume II of TM15 (DOE 1994a) presents detailed discussions of this analysis Briefly the analysis concluded that the presence of multiple sources throughout the facility and the placement of the RAAMP samplers limits the specific applicability of RAAMP data to OU 5

Examination of the special OU 5 sampler data indicated that the uranium 233/234 and uranium 235 results were within the same order of magnitude for both the sampler downwind of IHSS 115/196 and the sampler upwind of OU 5 The americium 241 plutonium 239/240 and uranium 238 average activities for the downwind sampler were one order of magnitude greater than the average activities of the upwind sampler

Results of the H&S monitoring that was done during the field investigations of IHSS 115/196 provided a qualitative indication of potential air pathway risks attributable to this source Elevated organic vapor readings were observed during investigations at only two borehole locations during drilling operations During field investigation of high purity germanium (HPGe) anomalies B 7 and B 8 near the center of the Original Landfill beta gamma monitoring registered 60 000 counts per minute (cpm) on one occasion and 10 000 80 000 cpm on another

### 2 2 1 7 Implementation of TM15

Implementation of field work outlined in TM15 (DOE 1994a) for IHSS 115/196 began in September 1994 In summary the work consisted of

- Evaluation of Intrinsic Air Permeability Tests
- Geotechnical Evaluation
- Groundwater Investigation and
- Air Programs and Wind Resuspension Investigation

Specific work elements and results of implementing the work are summarized in the following sections The results of these investigations are presented in additional detail where applicable in Chapters 3 0 and 4 0 of this report

Evaluation of Intrinsic Air Permeability Tests A small scale intrinsic air permeability study resulted in calculated permeabilities that were orders of magnitude greater than expected for clayey soils Intrinsic air permeability was estimated by the method presented in *A Practical Approach to the Design Operation and Monitoring of In Situ Soil Venting Systems* (Johnson *et al* 1990) Two possible explanations for this discrepancy were that the soils at the test sites were not clayey or that short circuiting of the vapor flow path occurred during the test (e g gas flows from surface down along probe and into sampler) Because the test was conducted in the same manner as the soil gas survey it is possible that short-circuiting occurred during the survey and that the observed soil gas concentrations are lower than those actually occurring in the subsurface formation

To assess the likelihood of each explanation recorded survey vacuum pressures were reviewed along with the borehole logs for nearby areas In those locations where vacuum readings are not greater than background and the soil lithology is known to be of low permeability short circuiting may have occurred This situation may also be explained by fractures (e g desiccation cracks) or macropores (e g worm burrows root channels) Analytical laboratory data for soils in those areas were also reviewed for correlation

For each borehole nearby soil gas survey locations were identified For each borehole for which a log was available the data for the soil gas vacuum versus time were analyzed as described in Johnson *et al* (1990) Calculated values were then compared to values reported (Johnson *et al* 1990) for similar types of soils as identified on the borehole logs at corresponding depths (see Table 2 1) In each case the calculated permeability (k) values either concurred with the borehole logs or indicated a less permeable soil type Therefore it may be concluded that short circuiting did not occur at locations near boreholes

Although most of the soil gas samples were collected by the hydraulic probing and purging system several soil gas survey locations were purged with a manual pump This manual apparatus was not equipped to monitor vacuum levels However manual purging took more time than the hydraulic system. Therefore the gradient of vacuum versus time was less likely to induce short circuiting

For soil gas sample locations that are not near boreholes there are no known lithologic data to which calculated k values may be compared However the vacuum readings for the entire soil gas survey were reviewed to evaluate occurrences that did not exceed background Background vacuum (for the probe and tubing system in ambient air) was recorded at 3 5 inches Hg (mercury) during the intrinsic air permeability study Data from the soil gas survey revealed the lowest 5 minute vacuum reading to be 4 1 inches Hg a value 17 percent greater than background

Because background vacuum levels were significantly exceeded at all locations of the soil gas survey where the hydraulic system was used calculation-derived soil types generally concur with those described in borehole logs and manual purging is unlikely to induce short circuiting it was concluded that short circuiting did not occur during the soil gas survey at IHSS 115 Therefore results of the soil gas survey were considered to be representative of actual field conditions

Geotechnical Evaluation Section 3 1 2 2 in Volume I of TM15 (DOE 1994a) outlined a geotechnical program to evaluate the stability of the slopes along IHSS 115 The following two work elements were completed

- Obtain subsurface geometry
- Collect subsurface soil samples to characterize geotechnical properties of subsurface materials

This section describes the methodology for obtaining subsurface data and the collection of geotechnical samples for analysis Results of the geotechnical sample analysis including the final stability analysis will be presented in subsequent FS reports for OU 5

The subsurface geometry was evaluated from existing data and from drilling 20 additional boreholes Locations shown in Figure 2 4 were based on the overall visible width of the existing failures and the accessibility Soil samples were collected in accordance with SOP GT 2 Drilling and Sampling Using Hollow Stem Auger Techniques Table 2 2 is a summary of borehole information for the TM15 field investigation including the geotechnical borehole program

To facilitate the access of the hollow stem auger drill rig to the geotechnical boreholes located in the central landslide area, a temporary fill road was constructed The temporary fill road was located between the well cluster for 58394 57194 and 71494 and boring 56894 as shown on Figures 2-4 and 3 16 The temporary fill road was placed using clean fill and without excavating the existing hillside

Core samples collected from the geotechnical boreholes were retained in core boxes and logged (Appendix B) Core samples were not submitted for environmental chemical analysis on the basis of the field screening results which indicated no contamination Described in TM15 if field screening results had indicated the potential for contaminants environmental samples would have been collected for analysis for OU 5 target analytes (Table 3 1 2 1 of Volume I of TM15 [DOE 1994a])

Composite samples were obtained from drill cuttings and analyzed for OU 5 target analytes (Table 3 1 2 1 of Volume I of TM15 [DOE 1994a]) These samples were collected to characterize the drummed cuttings in order to determine the proper method for disposal of the cuttings A summary of the data from these composite samples is included in Tables 2 3 through 2 5 This table and all other summary tables in this chapter provide an indication of the difference in concentrations for each constituent in samples collected during the TM15 field investigation and those collected during the investigation outlines in the OU 5 Work Plan (DOE 1992a) this information is provided to assist in evaluating whether the results of the TM15 field investigation would impact the results of the HHRA and ERA which were based on the data collected prior to the implementation of TM15 (see Section 6 0)

With the exception of thallium concentrations of metals in the composite samples were within the range of either the background or pre TM15 data (Table 2 3) Thallium concentrations however are of the same magnitude as those detected in background and pre TM15 samples Detected radionuclide activities were within the ranges of the pre TM15 data (Table 2 4) As listed on Table 2 5 there were several organic compounds detected in these drum characterization samples However these organic compounds were primarily detected at concentrations below those detected in pre TM15 samples or the reporting limit or were common laboratory contaminants (e g acetone methylene chloride and the phthalates)

As part of the groundwater investigation 2 inch nominal diameter PVC piezometers were installed in nine geotechnical borehole locations (Figure 2 4) These piezometers were sampled for OU 5 target analytes (Table 3 1 2 1 of Volume I of TM15 (DOE 1994a) provided sufficient groundwater is present

Groundwater Investigation The groundwater investigation consisted of many activities including characterizing the thickness of alluvial material along Woman Creek and performing aquifer testing However the primary activity of the investigation centered around evaluating the presence and quality of groundwater Various installation types (wellpoints monitoring wells small diameter wells and piezometers) were utilized for these activities Small diameter wells are defined as ½ inch to 1 inch nominal diameter PVC installed in one to 1 5 inch nominal diameter boreholes These work elements and their results are presented in the following paragraphs

To further characterize the bedrock surface and thickness of the valley fill alluvium and colluvium along Woman Creek three small-diameter (nominal 1 inch) boreholes were advanced approximately two feet into weathered bedrock. These three locations (58094 58194 and 58594) were located as close to the creek bed as practical (Figure 2 4) Soil samples (core) were collected continuously with a Kansas sampler Core was retained in core boxes and logged (see Appendix B) Because these locations are outside the IHSS boundary core was screened by field instruments and no environmental analytical samples were collected However one soil sample from each location was collected for soil moisture analysis Piezometers were installed in each borehole and subsequently developed

A single well pumping test was performed at well 59593 on May 11 1994 This test was performed when the static water level was higher than at the time of the previous slug test This allowed the hydrostratigraphic unit to be stressed more than in the previous test. The results of this test are presented in Appendix D

In order to more completely evaluate the presence and quality of groundwater at and downgradient of IHSS 115/196 additional groundwater samples were obtained Because the presence and quantity of groundwater appeared to be limited this task consisted of three work elements

- Installation and development of nine upper hydrostratigraphic unit (UHSU) monitoring wells/piezometers five small diameter monitoring wells and six bedrock (LHSU) monitoring wells (Figures 2 4 and 3 16)

- Measurement of water levels in all wellpoints small-diameter wells piezometers and monitoring wells that are along or north of Woman Creek, south of the south Buffer Zone access road east of the western edge of IHSS 115 (approximately location CPT07393) and west of the eastern edge of IHSS 115 (approximately location CPT05393) on a monthly basis for one year and

- Collection and analysis of groundwater samples from any location that was downgradient of IHSS 115/196 provided water level measurements indicated the presence of a sufficient quantity of water

*Installation of Groundwater Monitoring Locations* Nine monitoring wells were installed in geotechnical boreholes where groundwater was or could possibly be encountered

Five small diameter wells (57994 58294 58494 58694 and 58794) were placed in bedrock lows that were identified during the CPT investigation (but where water was not detected during the CPT investigation) and in between existing wellpoints Of the five small-diameter wells installed four were installed downgradient of IHSS 115/196 and one was installed in the surface disturbance east of the Original Landfill in the vicinity of borehole 50792 These small diameter wells were installed using a small hydraulic drill rig that does not produce soil cuttings Composite soil samples were collected during drilling and submitted for analysis in accordance with the procedures outlined in TM7 (DOE 1993g) Analytical parameters for soil samples are specified in the OU 5 Work Plan and Table 3 1 2 1 of Volume I of TM15 (DOE 1994a) Twenty five composite samples were collected in this manner In addition discrete samples were collected at 2 foot intervals for VOC analyses Forty three VOC samples were obtained Groundwater was subsequently observed at locations 57994 58494 and a one time measurement from 58794

Table 2 3 presents summary statistics for metals data from subsurface soil samples obtained from boreholes where monitoring wells were installed With the exception of selenium metals were detected at concentrations that were within the ranges of both the background and pre TM15 data. Selenium was detected at concentrations that exceeded the pre TM15 data but were within the range of background concentrations Radionuclides were detected at activities that were within ranges of both background and pre TM15 data except americium 241 and plutonium 239/240 (Table 2 4) Activities of americium 241 and plutonium 239/240 were above those of background data, but were within the pre TM15 data. As listed on Table 2 5 there were several organic compounds detected in subsurface soil samples However these organic compounds were primarily detected at concentrations below those detected in pre TM15 samples or the reporting limit, or were common laboratory contaminants

Six bedrock monitoring wells (57194 57594 59394 59894 71194 and 71494) were installed at IHSS 115/196 Three (57194 71194 and 71494) were installed as part of the geotechnical program and the other three (57594 59394 and 59894) were installed specifically as part of the groundwater investigation Figure 2 4 shows the locations of the six bedrock monitoring wells around IHSS 115/196 Data from these monitoring wells have been used to evaluate the hydraulic interaction between the groundwater from the UHSU and the lower hydrostratigraphic unit (LHSU) (see Section 3 8 1)

Five of the six boreholes for bedrock wells were geophysically logged with neutron natural gamma, gamma gamma density EM induction and caliper tools On the basis of the recovered core and the geophysical logs construction details were selected Wells were constructed with 2 inch nominal diameter PVC casing with a 0 01 inch slotted screen Table 2 2 provides a summary of well completion details Bedrock well 59394 was originally scheduled to be installed in borehole 56694 but because 56694 caved in after being geophysically logged 59394 was drilled

Data acquired from all six bedrock monitoring wells were helpful in evaluating the presence of an inferred fault trace in the area of the Original Landfill as presented in section 3 8 1 2 of this report (also in Section 7 of EG&G (1995a) as inferred Fault 2) From the logs it appears that a marker bed is approximately 60 feet higher in location 71194 (west of the inferred fault) than in location 57194 (east of the inferred fault)

Bedrock wells 57194 and 71494 are adjacent to UHSU piezometer 58394 and well 71194 is adjacent to UHSU piezometer 59794 Two potential water bearing intervals were identified on the geophysical logs from well 57194 Well 71494 was installed adjacent to well 57194 to screen this separate water bearing interval Water levels at these locations indicate a downward vertical gradient On the basis of the analytical data, well 71494 appears to be screens across a weathered siltstone that is in apparent hydrolic connection with the UHSU No contaminants were observed in LHSU bedrock wells 57194 57594 or 59894 which had sufficient groundwater for sampling

*Measurement of Groundwater Levels* Water levels have been measured in all the monitoring wells wellpoints small diameter wells and piezometers located in the immediate vicinity of IHSS 115/196 including the small diameter wells along Woman Creek Appendix C presents a summary of these water level measurements for the period September 1994 through August 1995 Groundwater contour maps and discussions of groundwater flow are presented in Section 3 8 1 3

*Collection and Analysis of Groundwater Samples* Groundwater samples were obtained from any wellpoint or small diameter well that was downgradient of IHSS 115/196 if water level measurements indicated the presence of a sufficient quantity of water The first quarter of groundwater samples was collected from December 21 1994 to February 1 1995 and the results are summarized in this section Groundwater samples have been collected in the priority listed on Table 3 1 2 3 1 of Volume I of TM15 (DOE 1994a) Table 2 6 presents a summary of locations that were sampled and includes a checklist of requested analyses for each location Tables 2 7 through 2 10 present summary statistics for data from groundwater samples obtained from wells around IHSS 115/196 these data are discussed below

With the exception of thallium total concentrations of metals in unfiltered samples are within the ranges of the background data or the pre TM15 data (Table 2 7) Thallium was detected in only one sample and it was detected at a similar albeit greater total concentration than both background and pre TM15 data. The constituents in unfiltered samples that were detected above either the background or pre TM15 data were detected at concentrations of similar magnitude to those data

Concentration ranges of dissolved of antimony calcium cobalt, and magnesium in groundwater samples exceeded ranges of both the background and pre TM15 data (Table 2 8) These concentrations were of similar magnitude to both the background and pre TM15 data. Concentrations of the remaining metals were within the ranges of the background or pre TM15 data for groundwater

Activities of radionuclides in unfiltered groundwater samples at IHSS 115 were within the ranges of the background or pre TM15 data (Table 2 9) The radionuclides that had activities above either the background or pre TM15 data, had activities of similar magnitude to those data. With the exception of strontium 89/90 activities of dissolved radionuclides in groundwater samples were within the ranges of either the background or pre TM15 data (Table 2 9) The maximum activity of dissolved strontium 89/90 activity was 2 2 pCi/L as compared to 1 8 and 1 83 pCi/L for the background and pre TM15 data respectively

As listed on Table 2 10 there were 39 organic compounds detected in groundwater samples Only 17 of these organic compounds were detected with a frequency of detection greater than 5 percent or in more than three samples Moreover these organic compounds were primarily detected at concentrations below the contract required reporting limit

Air Program and Wind Resuspension Investigation TM15 (DOE 1994a) described four air quality investigations RAAMP special OU 5 ambient air samplers an investigation of the wind resuspension potential and an examination of the volatilization of soil gases Operation of the RAAMP and OU 5 samplers has continued as part of the routine air quality monitoring programs at RFETS TM15 (DOE 1994a) recommended the investigation into the volatilization of gases from OU 5 only if inhalation of volatile chemical species was determined to be an exposure pathway of concern The inhalation of volatile organic compounds by current or future receptors has not been designated a complete exposure pathway (Chapter 6 0)

The remainder of this section discusses the supplemental field investigation into the wind resuspension potential for soils in OU 5 including presentation of the objectives methods and results of the study Wind resuspension potentials for all the OU 5 IHSSs are discussed in Section 5 3 3 2

### 2 2 2 IHSS 133 (Ash Pits Incinerator and Concrete Wash Pad)

Section 2 5 of Volume II of TM15 (DOE 1994a) provides a detailed discussion of the methodology for and results of the Phase I investigation conducted at the IHSS 133 group prior to implementation of TM15 (DOE 1994a) A summary of the information related to the IHSS 133 group and presented in Volume II of TM15 (DOE 1994a) is provided in this section along with the results of implementation of the activities proposed in TM15 Figure 1 2 shows the relation of these IHSSs to RFETS Figure 2 10 is a larger scale map of the IHSS 133 group showing locations sampled prior to the implementation of TM15

#### 2 2 2 1 Stage 1

Stage 1 activities at the 133 series IHSSs consisted of a review of historical aerial photographs to evaluate the extent of each disposal area. The results of this review are discussed in detail in Section 2 5 1 of Volume II of TM15 (DOE 1994a) In summary IHSSs 133 1 and 133 3 were incorrectly located on maps prior to TM15 (DOE 1994a) The corrected locations are shown on Figure 2 10

### 2 2 2 2 Stage 2

Stage 2 activities at the IHSS 133 sites included surface radiological and geophysical surveys as were specified by the OU 5 Work Plan These activities are discussed in detail in Section 2 5 2 of Volume II of TM15 (DOE 1994a) and are summarized in the following paragraphs

<u>HPGe and FIDLER Surveys</u> A radiological survey of the IHSS 133 area was initiated in the summer of 1992 using tripod mounted HPGe gamma ray detector instruments This initial survey did not cover the entire IHSS 133 area and was followed by a second truck mounted HPGe survey to provide full coverage for each IHSS 133 site In addition to the HPGe surveys an instrument for the detection of low energy radiation (FIDLER) was used to focus sampling investigations within anomalies identified by the HPGe surveys

The 1992 tripod mounted HPGe survey identified two areas of anomalous uranium 238 activity One of these areas also displayed an elevated uranium 235 activity The 1993 truck mounted survey corroborated the anomalous activity detected by the 1992 survey at one location but not at the other The area identified by both HPGe surveys and the FIDLER survey was located immediately to the south and downslope of a small mound and depression As shown on Figure 2 10 it was identified as an area approximately 35 ft wide and 76 ft long The area has been posted as an RCA No historical information regarding the origin of the mound and depression was found during investigation of this area, however borehole (58093) was drilled within the mound and encountered waste fill material (Section 2 2 3 2 in Volume II of TM15 [DOE 1994a])

The anomaly associated with the 1992 tripod mounted HPGe survey that was not identified by the 1993 truck mounted survey was also not confirmed by the FIDLER survey However the FIDLER survey identified an anomalous area in the vicinity of this location

<u>Geophysical Surveys</u> Frequency domain EM and magnetometer geophysical surveys were conducted in IHSS 133 from October through December 1992 In addition a time-domain electromagnetic (TDEM) survey was conducted in IHSS 133 from January through February 1994 This TDEM survey was performed with a Geonics EM61 instrument, an instrument that was not available at the time the other

geophysical surveys were performed The results of these surveys are discussed in detail in Section 2 5 2 2 in Volume II of TM15 (DOE 1994a)

The success of the frequency domain EM and magnetometer surveys in confirming the locations of the known ash pits or identifying unknown disposal sites was limited The magnetic survey indicated an anomaly on the west side of the IHSS 133 area, with dimensions similar to those of the Ash Pits The TDEM survey produced excellent results (Figure 2 11) This survey confirmed the locations of several pits previously identified and corroborated results of the borehole program (Section 2 2 2 3) The TDEM survey identified several anomalous areas that required further investigation as specified in Section 3 2 2 1 in Volume I of TM15 (DOE 1994a) The soil borehole program and the investigation of TDEM anomalies are discussed later in this report

### 2 2 2 3 Stage 3

Stage 3 activities at the IHSS 133 sites included the collection of surface and subsurface soil samples in and around each IHSS In addition subsurface soil samples were collected from within the anomaly west of the IHSS 133 area identified by the magnetic survey These activities are discussed in detail in Section 2 5 3 in Volume II of TM15 (DOE 1994a) and are summarized in this section

<u>Surface Soil Sampling</u> The scope of work for the Stage 3 surface soil sampling program is described in TM4 (DOE 1993d) There were two phases of surface soil sampling

- Characterize concentrations of metals and polynuclear aromatic hydrocarbons (PAHs) and confirm the results of the initial HPGe survey for radionuclides and

- Assess areas of elevated radioactivity that were identified after the second radiation survey was completed

The surface soil sampling program is discussed in Section 2 5 3 1 of Volume II of TM15 (DOE 1994a) A total of 20 surface soil samples were collected at 20 locations in IHSS 133 Two sediment samples from seeps were also collected Figure 2 10 shows the locations of the surface soil and seep sediment samples

Elevated concentrations of zinc and silver were detected in only a few surface soil samples Gross alpha, uranium 233/234 and uranium 238 were detected with activities exceeding background UTLs The ratio of Uranium 235 to Uranium 238 indicated that the uranium present in surface soils is primarily depleted Uranium 238 None of the surface soil samples contained detectable concentrations of PAHs

Zinc antimony and uranium 238 were detected at levels exceeding background UTLs in the seep sediment samples The SVOC bis(2 ethylhexyl)phthalate was detected in one of the seep sediment samples Neither seep sediment sample contained detectable concentrations of PAHs or VOCs

Soil Boreholes Based on the results of the aerial photograph review and geophysical survey TM7 (DOE 1993g) proposed a soil borehole program that included drilling 28 boreholes and an undesignated number of shallow offset boreholes to be used in locating the Ash Pit(s) TM7 also proposed placing a borehole in the central location of any anomalous areas detected by the HPGe survey Section 2 5 3 2 of Volume II of TM15 (DOE 1994a) discusses drilling sampling and results of the borehole program

The completed soil boring program consisted of 53 boreholes (Figure 2 10)

- Two were placed in the mound north of a hot spot that was detected during the HPGe survey
- Six were originally intended to be wells as part of the groundwater investigation however no groundwater was encountered and they were reclassified as boreholes
- Seventeen were 10 to 12 foot deep offsets drilled to assist in locating the ash pits and
- The remaining 28 boreholes were drilled in the locations specified in TM7 (DOE 1993g)

Soil samples were collected from all of the boreholes except the offsets and four one time groundwater samples were collected with a Hydropunch II sampling device during drilling from boreholes located within waste fill material that contained groundwater

Soil and groundwater samples from boreholes that encountered waste fill material typically contained concentrations of metals and radionuclides that exceeded background UTLs One sample contained some asbestos containing material (ACM) Samples from boreholes that did not encounter waste material generally contained background levels of most constituents

Investigation of Magnetic Anomaly A magnetic anomaly west of IHSS133 was investigated by drilling three boreholes(64493 64593 and 64693) along the long axis of the anomaly No ash, waste material or groundwater were encountered in these boreholes The unconsolidated material encountered appeared to be undisturbed colluvium The analysis of soil samples collected from these boreholes indicated one barium result, one nickel result, and two plutonium 239/240 results greater than background UTLs

Results of the drilling investigation of the magnetic anomaly west of IHSS133 indicated that there was no ash pit or other disposal unit in this area This conclusion was further supported by the results of the TDEM survey which do not indicate the presence of any buried waste material in this area.

### 2 2 2 4 Stage 4

Stage 4 activities at the IHSS 133 sites consisted of the installation and sampling of groundwater monitoring wells and aquifer testing The implementation and results of these activities are discussed in Section 2 5 4 of Volume II of TM15 (DOE 1994a) and are summarized in the following paragraphs

Groundwater Investigation Nine locations were drilled in the IHSS 133 area, in the attempt to install the four proposed monitoring wells Groundwater was encountered in only three of the nine locations At the time TM15 was written groundwater samples were being collected on a quarterly basis from only one well 58793 which was producing sufficient quantities of groundwater During the implementation of TM15 the other two wells 59093 and 63093 were sampled The results for these wells are included in the paragraphs that follow

A few metals were detected at levels greater than background UTLs in one or two soil samples collected during drilling operations Plutonium 239/240 was detected at concentrations exceeding the background UTL in three soil samples taken from these wells/boreholes

Analyses of unfiltered samples from well 58793 detected 12 to 18 metals at concentrations exceeding background UTLs Analyses of filtered portions of these same samples resulted in only manganese concentrations greater than the background UTL This well has also contained above background activities of americium 241 and radium 226 in unfiltered samples

A multiple well aquifer pumping test was unsuccessfully attempted at well 58793 (see Section 2 5 4 1 of Volume II of TM15 [DOE 1994a]) This test was repeated on May 10 1994 and the results are presented in Appendix D

### 2 2 2 5 Ambient Air Monitoring

Ambient air monitoring activities associated with the site characterization of IHSS 133 were similar to those conducted for the investigation of IHSS 115 (Section 2 2 1 6) These activities are discussed in Section 2 5 5 of Volume II of TM15 (DOE 1994a) and are summarized in the following paragraphs

The sampling results of the special OU 5 sampler situated downwind of IHSS 133 were similar to those for the IHSS 115 downwind sampler Examination of the data for the special OU 5 sampler indicated that the uranium 233/234 and uranium 235 results were within the same order of magnitude for both the sampler downwind of IHSS 133 and the sampler upwind of OU 5 These data seemed to indicate no discernible contributions to ambient levels of either uranium 233/234 or uranium 235 from IHSS 133 This same analysis appeared to apply also to plutonium 239/240 in the case of IHSS 133 Conversely the americium 241 and uranium 238 average activities for the downwind sampler were one order of magnitude greater than the average activities of the upwind sampler Contributions to ambient levels of americium 241 or uranium 238 by IHSS 133 appeared possible

No elevated organic vapor levels were observed during field investigations of IHSS133 Elevated beta gamma readings exceeding a background of 250 cpm were encountered during borehole activities at four locations None of the results for ACM monitoring exceeded the American Conference of Governmental Industrial Hygienists (ACGIH) 8 hour Time Weighted Average occupational exposure limit of 2 fibers per cubic centimeter Results indicated that there were some potential for release of ACM during ground disturbance activities

### 2 2 2 6 Implementation of TM15

Implementation of field work outlined in TM15 (DOE 1994a) for the IHSS 133 area began in September of 1994 and was completed in August 1995 In summary the work consisted of

- Investigation of TDEM Anomalies
- Groundwater Investigation and
- Air Monitoring

Details of this additional work as well as the results are presented in the following subsections

Investigation of TDEM Anomalies The TDEM survey identified many geophysical anomalies throughout IHSS 133 A comprehensive visual inspection was performed over the entire geophysical survey grid to identify areas where surface metallic debris (i e cans and fence posts) was present. Nine boreholes (Figure 2 12) were drilled in four anomalous areas identified by the TDEM survey that could not be associated with surface debris Specifically

- 56194 is located approximately 10 ft southeast of the concrete pad, in the north-central portion of IHSS 133
- 55194 55294 59994 and 60094 are located approximately 25 ft north of IHSS 133 6 and 25 ft south of the dirt road underneath the power lines (55194 was converted to a small-diameter well) (59994 and 60094 are located in the anomaly identified as TDEM 1)
- 55694 is at IHSS 133 4 in the center of the TDEM anomaly associated with the northern trench approximately midway between existing boreholes 55993 and 56093C and
- 55894 55994 and 56094 were advanced on either end and in the center of the geophysical anomaly (TDEM 2) between IHSS 133 3 and IHSS 133 4 approximately 20 ft south of the dirt road beneath the power lines

A tenth borehole (58894) was drilled in an additional TDEM anomaly identified at TDEM survey coordinates 540 East and 180 South (Figure 2 12) The area is approximately 5 by 8 feet in area and described as a small oblong mound Borehole 57294 was drilled in the northern half of IHSS 133 1 adjacent to boring 56893 to obtain bulk ash samples of the waste fill for treatability studies being conducted for the OU 5 FS Table 2 2 includes a summary of these boreholes Table 2 2B presents the treatability analytical results from the bulk ash sample from boring 57294 IHSS 133 2 Toxic characteristic leaching potential (TCLP) metal results from five composite subsamples from the bulk sample indicated only one result for lead at 18 mg/L greater than the Land Disposal Restrictions (LDRs) for metals

Tables 2 3 through 2 5 presents summary statistics for subsurface soil samples obtained while investigating the TDEM anomalies at IHSS 133 Barium beryllium cadmium cobalt, copper lead molybdenum selenium thallium, and zinc were detected in subsurface soil samples at concentrations which exceeded the ranges detected in background and pre TM15 data (Table 2 3) Typically the highest concentration detected was in sample BH00034AS from borehole 55994 drilled in TDEM 2 Concentrations of the remaining metals were within the ranges of either the background or pre TM15 data for subsurface soil samples

With the exception of plutonium 239/240 and uranium 233/234 activities of radionuclides in subsurface soil samples from boreholes within the TDEM anomalies were within the ranges of either the background or pre TM15 data (Table 2 4) The elevated activities of plutonium 239/240 and uranium 233/234 detected were of similar magnitude to the pre TM15 data.

Table 2 5 presents summary statistics for organic compounds that were detected in subsurface soil samples from TDEM anomalies in IHSS 133 The only organic compounds detected were the VOC/PCE and the SVOCs/benzoic acid bis(2 ethylhexyl)phthalate di n butyl phthalate and phenanthrene These five compounds were detected in only one sample at concentrations that were less than the maximum concentration detected in the pre TM15 samples

Groundwater Investigation Based on information from geologic logs of boreholes and monitoring wells in and around the IHSS 133 area, with regard to bedrock topography and degree of saturated soils there were several areas where insufficient data existed after completion of the FSP outlined in the OU 5 Work Plan (DOE 1992a) Consequently ten boreholes (55194 55394 55494 55594 55794 56294 56394 56494 56594 and 57894) were advanced and small-diameter piezometers installed at locations around IHSS 133 (Figure 2 12) Four (55494 55594 56294 and 56494) were installed downgradient of ash pits Five of these boreholes (55394 55794 56394 56594 and 57894) were located as close to the stream bed as possible Borehole 56394 could not be completed as a small-diameter piezometer therefore 71394 was drilled with an HSA drill rig and a well was installed These five locations were not installed as water quality monitoring wells rather they were piezometers whose only purpose is for collecting water levels Small diameter well 55194 was installed near TDEM 1 at the west end of IHSS 133 Subsurface soil samples (core) were collected continuously with a Kansas sampler (with the exception of 71394 which was a twin of borehole 56394) retained in core boxes and logged (see Appendix B) Because these locations were outside the IHSS boundaries core was only screened by field instruments No above background readings were obtained on any field instruments

Water levels were measured in all the monitoring wells wellpoints and piezometers that are along or north of Woman Creek, south of the West Access Road, east of the west perimeter road and west of the eastern extent of the IHSS 133 area from September 1994 through August 1995 These water level measurements are summarized in Appendix C

Groundwater samples were obtained from any monitoring wells small-diameter well and wellpoints that were adjacent to or downgradient of an IHSS or TDEM anomaly (except the piezometers along Woman Creek because they were not constructed for sampling) if water level measurements indicated presence of a sufficient quantity of water Specifically wells 58793 59093 63093 63693 63793 55394 and 56594 were sampled Table 2 6 presents a checklist of which locations were sampled and for which analytical groups they were analyzed Tables 2 7 through 2 10 present summary statistics for the analytical data from these groundwater samples The results of these analyses are discussed below

Concentrations of total metals were within the ranges of either the background or pre TM15 data (Table 2 7) Only aluminum beryllium, iron potassium silicon and vanadium were detected exceeding the background range These concentrations from samples of unfiltered groundwater were of similar magnitude to both the background and pre TM15 data. Mean concentrations of metals in these groundwater samples were similar to those for the pre TM15 data.

Concentrations of dissolved metals were within the ranges of either the background or pre TM15 data (Table 2 8) Concentrations of dissolved nickel exceeded the dissolved groundwater background range but were detected with similar frequency and concentrations Selenium was detected in one groundwater sample at a concentration that exceeded the pre TM15 data, but the concentration detected was well within the range of background concentrations

With the exception of radium 226 activities of radionuclides in samples of unfiltered groundwater for IHSS 133 were within the range of both the background and pre TM15 data (Table 2 9) Radium 226 had an activity that exceeded the background range but those activities were within the pre TM15 range

With the exception of cesium 137 activities of dissolved radionuclides in the recent groundwater data for IHSS 133 were within the range of both the background and pre TM15 data (Table 2 9) Dissolved cesium 137 had an activity that exceeded the pre TM15 range but the activities were within the background range

Volatile organic compounds methylene chloride and acetone were detected in two groundwater samples from IHSS 133 (Table 2 10) Acetone was detected at a concentration marginally above the detection limit in one sample SVOCs bis(2-ethylhexyl)phthalate butyl benzyl phthalate di n butyl phthalate and di n-octyl phthalate were detected in one groundwater sample from IHSS 133 These four constituents were detected at concentrations below the contract required reporting limits and are common field or laboratory contaminants Four TICs (cyclohexane (DOT) dodecanoic acid hexadecanoic acid and octadecanoic acid) were also detected in groundwater samples from IHSS 133 These four constituents were detected at concentrations below contract required reporting limits

A visual survey to characterize where bedrock crops out in the stream channel along the length of Woman Creek downgradient of the IHSS 133 series area was conducted on October 14 1994 This information was used to revise the bedrock topography map and provided input to the hydrogeologic model The survey did not identify any locations where bedrock crops out in the stream channel

A pumping test was performed at 58793 while water levels were monitored in 63593 63693 and 63793 The test was conducted on May 10 1994 Data are presented in Appendix D The results of this test were comparable to those from the previous test reported in TM15 (DOE 1994a) Both tests were unsuccessful in obtaining the hydrogeologic characteristics of the water producing strata at this location

Air Monitoring TM15 (DOE 1994a) described four air-quality investigations RAAMP special OU 5 ambient air samplers an investigation of the wind resuspension potential and an examination of the volatilization of soil gases Operation of the RAAMP and OU 5 samplers has continued as part of the routine air quality monitoring programs at the Site The potential for resuspension of contaminated soil was not directly addressed in the investigation of IHSS 133 To make this evaluation required an estimation of the corrected threshold friction velocity of the soil The phased investigation procedures to acquire corrected threshold friction velocity data for IHSS 115 are applicable to IHSS 133 and are discussed in Section 2 2 1 7

Because any VOCs would have been destroyed during the incineration process volatile chemical species were not a concern in IHSS 133 Therefore no field work to measure the emission rates of volatile species was conducted for IHSS 133

## 2 2 3 IHSS 142 10 and 142 11 (C Ponds)

Section 2 6 of Volume II of TM15 (DOE 1994a) provides a detailed discussion of the methodology for and results of the Phase I investigation conducted at IHSS 142 10 (C 1 Pond) and 142 11 (C 2 Pond) prior to implementation of work outlined in TM15 A summary of the information presented in Volume II of TM15 is provided below along with the results of implementation of activities proposed in TM15 Figure 1 2 shows the relation of these IHSSs to RFETS Figure 2 13 is a larger scale map of the IHSS 142 area.

### 2 2 3 1 Stage 1

Stage 1 activities consisted of evaluating the existing data. The results of Stage 1 evaluations were used to develop surface water and sediment sampling activities as presented in TM1 (DOE 1993b) The results of this evaluation are discussed in Section 2 6 1 of Volume II of TM15 (DOE 1994a) and are also presented in detail in TM1 (DOE 1993b)

### 2 2 3 2 Stage 2

There were no Stage 2 activities

### 2 2 3 3 Stage 3

Stage 3 investigation activities at Ponds C 1 and C 2 consisted of additional surface water and sediment sampling and the installation and monitoring of wellpoints along Woman Creek and its tributaries These activities are discussed in detail in Section 2 6 2 of Volume II of TM15 (DOE 1994a) the Hydrogeologic Data Summary Report (Appendix A) and are summarized in the following paragraphs

Surface Water and Sediment Sampling This section presents a summary of surface water and sediment sampling along the Woman Creek drainage including Woman Creek the South Intercept Ditch the C Series Ponds and the pond like depressions in IHSS 209 These various sampling locations are discussed together rather than with their associated IHSS because they are all part of a single system Volume II of TM15 (DOE 1994a) presents detailed discussions of the result of each sampling event by IHSS Also the results of the surface water and sediment sampling activities at Ponds C 1 and C 2 are detailed in Appendix A

Twenty eight surface water samples were collected from various locations in the Woman Creek drainage Water samples were obtained during two base flow sampling events (November 1992 and March 1993) and three high flow sampling events (March and May 1993 and April 1994) Water sampling activities conducted at the ponds consisted of two HydroLab surveys to develop depth profiles of the surface water sediment interface at both ponds In addition surface water samples were collected from the pond like depressions at IHSS 209

Analyses of the data from the two base flow and first high flow sampling events indicated that only a few samples contained some analytes at concentrations greater than those of background This indicated that, in general constituents were not seeping into the creek and were not being washed into the creek at rates sufficient to be detected at elevated concentrations

A general conclusion regarding the ponds was that both thermal and chemical stratification of the C ponds was very weak to nonexistent during all months of the year No concentrations exceeding background Upper Tolerance Limit (BUTLs) were noted for radionuclides metals or organic constituents associated with the samples from the pond like depressions

Stream sediment samples were also collected during a one time sampling event at various locations in the Woman Creek drainage One time sediment samples were also collected from both ponds Sediment samples were collected from the pond like depressions at IHSS 209 when no water was present in them during the surface soil sampling discussed in Section 2 2 4 3

Several constituents were detected at concentrations exceeding background UTLs in stream sediment samples from various locations in Woman Creek Based upon the pond sediment concentrations and comparisons with background UTLs mercury barium calcium and zinc were detected at concentrations exceeding background

<u>Well Point Installation and Monitoring</u> Thirty six wellpoints were installed along Woman Creek, as outlined in TM1 (DOE 1993b) The wellpoints were located to coincide with the Woman Creek channel gain/loss sites previously used to measure streamflows in Woman Creek by CSU and EG&G The results

of the well point and gain/loss measurements are summarized in Section 3 4 and discussed in detail in Section 2 6 2 2 of Volume II of TM15 (DOE 1994a) and Appendix A

### 2 2 3 4 Stage 4

Stage 4 activities at IHSSs 142 10 (Pond C 1) and 142 11 (Pond C 2) consisted of the installation and sampling of groundwater monitoring wells Section 2 6 4 of Volume II of TM15 (DOE 1994a) discusses the results of these activities and they are summarized in the following text.

Groundwater Investigation Two monitoring wells were installed immediately downgradient of each dam at Ponds C 1 and C 2 to monitor the saturated alluvium (Figure 2 13) Wells 50092 and 51193 below Pond C 1 have been sampled on a quarterly basis when sufficient groundwater is present The wells below Pond C 2 (50192 and 50292) have not produced sufficient water for sampling

None of the soil samples collected from the wells contained target analyte list (TAL) metal concentrations exceeding background Plutonium 239/240 and americium 241 were detected in soil samples and in composite samples from drums of cuttings that represented the upper 15 feet None of the soil samples collected from the wells contained pesticides or PCBs No SVOCs were detected in soil samples collected from any of the wells however tentatively identified compounds (TICs) were detected in soil samples from all four of the groundwater monitoring well boreholes VOCs (acetone methylene chloride and toluene) were detected in soil samples collected from all four monitoring well boreholes

Three groundwater samples collected from the wells below Pond C 1 had metal concentrations exceeding background UTLs Most of the results that exceeded background UTLs were from unfiltered samples Samples from these same wells also had radium 226 (total) and gross beta (dissolved) activities that exceeded background UTLs and detectible concentrations of SVOCs Samples from the wells have also contained elevated concentrations of chloride and total suspended solids None of the groundwater samples collected from these wells contained pesticides PCBs or VOCs

A multiple well aquifer pumping test was successfully completed on well 51193 located below Pond C 1 Water levels were monitored in small-diameter wells 63293 63393 and 63493 The resulting transmissivities ranged from 0 021 to 0 030 square ft per minute (DOE 1994a)

### 2 2 3 5 Implementation of TM15

No additional work at IHSSs 142 10 and 142 11 was proposed in TM15 (DOE 1994a)

## 2 2 4 IHSS 209 and Other Surface Disturbances

Section 2 7 of Volume II of TM15 (DOE 1994a) provides a detailed discussion of the methodology for and results of the Phase I investigation conducted at IHSS 209 the Surface Disturbance West of IHSS 209 and the Surface Disturbance South of the Ash Pits prior to implementation of work outlined in Volume I of TM15 (DOE 1994a) A summary of the information presented in Volume II of TM15 (DOE 1994a) is provided in this section along with the results of implementation of activities proposed in TM15 (DOE 1994a) Figure 1 2 shows the relation of these areas to the Site Figures 2 14 and 2 15 are larger scale maps of these areas

### 2 2 4 1 Stage 1

Aerial photographs and oblique photographs covering IHSS 209 and the two other surface disturbance areas were reviewed to assess the location and history of the surface disturbances The results of the aerial photograph review are discussed in detail in Section 2 7 1 of Volume II of TM15 (DOE 1994a) and are summarized below

Aerial photographs indicate that the vegetation and upper sediments had been stripped from IHSS 209 prior to 1955 and that prior to 1964 several pits had been opened within the site The review of the photographs subsequently resulted in both an extension of the overall length of the IHSS as compared to the dimensions shown on Figure 2 7 of the OU 5 Work Plan, and some adjustments to the locations of the pits that were shown on Figure 2 7 of the OU 5 Work Plan Specifically Stage 1 aerial photo review resulted in relocating the eight pits in the Surface Disturbance West of IHSS 209 approximately 250 ft to the north (Figure 2 14) Three additional pits were identified as a result of Stage 1 activities and confirmed during the Stage 2 field reconnaissance

The Surface Disturbance South of the Ash Pits is shown on Figure 2 15 and consists of an area of disturbed ground as well as an area that contains two open and two reclaimed pits The locations of the reclaimed pits shown on Figure 2 15 have been corrected as a result of Stage 1 activities according to scaled locations from the aerial photographs and do not agree with the locations shown on Figure 2 6 of the OU 5 Work Plan (DOE 1992a)

#### 2 2 4 2 Stage 2

Stage 2 activities at IHSS 209 and the other surface disturbances consisted of a visual inspection of each site to confirm the information obtained in Stage 1 and to evaluate if any debris or staining indicative of waste disposal are present Stage 2 also involved the performance of surface radiological surveys over each site The results of these activities are discussed in detail in Section 2 7 2 of Volume II of TM15 (DOE 1994a) and summarized in this section

Visual Inspection A visual inspection/site reconnaissance of IHSS 209 and the other surface disturbances was conducted on September 24 1992 The following paragraphs summarize the results of this inspection for each site The features described in these paragraphs are shown on Figures 2 14 and 2 15

*IHSS 209* The pond southwest of the road near the center of the site was found to be dry with a basin at least 10 ft in depth The pits shown throughout the area are small shallow excavations that are still open or partially backfilled There was no evidence that these pits were ever used for the disposal of waste materials The Stage 2 field reconnaissance confirmed that no significant debris or staining exist to indicate that waste disposal had occurred It appears that the largest disturbance on the northeast end of the area may have been used as a source of gravel prior to 1955

*Surface Disturbance West of IHSS 209* Stage 2 field reconnaissance confirmed the locations of all eight pits identified on aerial photographs The largest pit is located near the center of the site and was found to be several feet deep The largest pit was dry at the time of the inspection but holds water during periods of wet weather or snow melt and is now the host to a fairly large cottonwood tree indicating that the site has been open for a long period of time The remaining pits are small and shallow appear to be capable of holding water during wet weather and are heavily revegetated There is no indication that any of these pits had ever been used as disposal sites It is unclear what use the pits may have served The OU 5 Work Plan speculated that these pits may have been part of a planned radio tower installation However the configuration of these pits and the fact that the pits are located on a hillside rather than the top of the hill indicate that this may not be the case

*Surface Disturbance South of the Ash Pits* The field reconnaissance of the Surface Disturbance South of the Ash Pits confirmed the existence of the features noted in the OU 5 Work Plan and identified on the aerial photographs The disturbed area located in the southwest half of the site consists of large cobbles and small boulders of the Rocky Flats Alluvium and appears to have been disturbed for a possible borrow area. However there is no staining or debris associated with the site that would indicate disposal of any waste had occurred

FIDLER Surveys Section 7 2 4 of the OU 5 Work Plan specified that IHSS 209 and the other surface disturbances be surveyed with a FIDLER These surveys were performed on a grid as described in Section 2 7 2 2 of Volume II of TM15 (DOE 1994a) The FIDLER surveys of IHSS 209 and the other surface disturbances did not identify any areas of above background radiation The random survey of the pond/seep area on the northeast side of IHSS 209 also did not indicate any above background levels of radiation

### 2 2 4 3 Stage 3

Stage 3 activities at IHSS 209 and the other surface disturbances consisted of the collection of samples of surface water and sediments in the water filled pits Surface and subsurface soil samples were also collected at IHSS 209 and the other surface disturbances under Stage 3 These activities are discussed in Section 2 7 3 of Volume II of TM15 (DOE 1994a) and summarized in this section

Surface Water and Sediment Sampling Results of surface water and sediment sampling were discussed in Section 2 2 3 3

Surface Soil Sampling The surface soil sampling program for IHSS 209 and the other surface disturbances is described in the OU 5 Work Plan and in TM10 (DOE 1993i) Samples were collected at 19 locations as shown on Figures 2 14 and 2 15 None of the samples contained metals in concentrations that exceeded background UTLs and did not contain detectable concentrations of pesticides or PCBs Approximately half of the 19 surface soil samples contained plutonium 239/240 activities exceeding the background UTL and approximately half of these samples also contained americium 241 activities greater than the background UTL The samples with above background activities of radionuclides were collected from all three of the surface-disturbance sites The plutonium 239/240 activity (approximately 5 pCi/g) of one sample collected at the Surface Disturbance West of IHSS 209 was the highest detected in surface soil samples from any of the OU 5 IHSSs and consequently additional sampling was conducted under the implementation of TM15 Seven of the surface soil samples also contained detectable concentrations of SVOCs

Subsurface Soil Sampling Section 2 7 3 3 of Volume II of TM15 (DOE 1994a) discusses the results of the borehole program as well as the rationale for the number of boreholes One borehole (57693) was drilled in the Surface Disturbance West of IHSS 209 (Figure 2 14) and three boreholes (57793 57893 and 57993) were drilled in the Surface Disturbance South of the Ash Pits (Figure 2 15)

None of the boreholes drilled at the surface disturbances encountered groundwater The analyses of the subsurface soil samples identified one sample in which the concentration of chromium exceeded the background UTL One sample contained a plutonium 239/240 activity greater than the background UTL Pesticides and PCBs were not detected in any of the samples collected Benzoic acid a SVOC was detected in at least one sample from each of the boreholes Methylene chloride was also detected in several samples

### 2 2 4 4 Implementation of TM15

Implementation of field work outlined in Section 3 4 of TM15 (DOE 1994a) for IHSS 209 and the Surface Disturbances began in September 1994 In summary the work consisted of

- Surface Radiological Surveys
- Surface Soil Sampling and
- Air Programs and Wind Resuspension Study

Surface Radiological Survey Because Stage 3 surface soil sampling and analysis indicated elevated levels of radionuclides (specifically plutonium 239/240) the following surface radiological surveys were conducted at IHSS 209 and the other surface disturbances

- an HPGe survey and
- a FIDLER survey of HPGe anomalies

To provide full HPGe coverage of the areas of interest a grid spacing of 150 ft was used In addition to providing full coverage this geometry also reduced the size of the areas that needed to be FIDLER surveyed to a manageable size The HPGe survey indicated 24 anomalous areas with detectable americium 241 within IHSS 209 the Surface Disturbance West of IHSS 209 and the Surface Disturbance South of the Ash Pits (Figures 2 16 and 2 17) The HPGe detector is not capable of measuring plutonium 239/240 Therefore americium 241 a daughter product of plutonium 239/240 was used as an indicator to identify those locations where plutonium 239/240 may be present in surface soils

FIDLER surveys of the HPGe anomalous areas detected readings above background at six HPGe locations These six HPGe anomalies and above background FIDLER areas are as follows

IHSS 209

- **HPGe K 56** FIDLER K 56A (25 West/4 North) approximately 46 ft south of HPGe station K 56 was frisked with a Bicron B 50 beta/gamma probe with readings of 66 cpm 35 cpm 70 cpm and 61 cpm above background
- **HPGe K 57** FIDLER K 57A (10 West/90 North) approximately 60 ft northeast of HPGe station K 57 showed FIDLER counts of 350 cpm above background
- **HPGe L 55** FIDLER L 55A (0 West/100 North) located at the NNE corner of L 55 grid showed elevated FIDLER counts of 500 600 cpm above background
- **HPGe H-60** following are coordinates with FIDLER counts above background
  (0 West/10 North) 600 cpm (8 West/65 North) 750 cpm
  (16 West/60 North) 600 cpm (28 West/55 North) 600 cpm
  (28 West/96 North) 650 cpm (36 West/25 North) 625 cpm
- **HPGe I 62** following are coordinates with FIDLER counts above background
  (100 West/50 100 North) 350 cpm
  (92 West/50 North) 600 cpm
  (66 West/30 North) 600 cpm

Surface Disturbance West of IHSS 209

- No areas with activity above background

Surface Disturbance South of the Ash Pits

- **HPGe M 14** FIDLER M 14A (90 West/90 North) located approximately 70 ft northwest of HPGe station M 14 showed elevated FIDLER counts of approximately 750 cpm above background

Surface Soil Sampling Surface soil samples were collected from locations with the greatest activity as identified by the surface radiological surveys Samples were analyzed for americium 241 and plutonium 239/240 A total of six samples were collected from the five HPGe anomalies within IHSS 209 (Figure 2 16) One sample was collected at each of the FIDLER anomalies K 56A and L 55A (SS133194 and SS133294) Two samples were collected from each of the HPGe anomalies identified at stations H 60 (SS133594 and SS133694) and I 62 (SS133394 and SS133494) The relatively low activities detected with the FIDLER at these two stations did not warrant the collection of surface soil samples at the location of each FIDLER anomaly Therefore one sample was collected at the two FIDLER anomalies with the greatest number of counts At HPGe anomaly H 60 one sample was collected at coordinates 8 West/65 North (SS133594) and one was collected at coordinates 28 West/96 North (SS133694) Similarly samples were collected from the two FIDLER anomalies with the greatest number of counts within HPGe anomaly I 62 (coordinates 92 West/50 North SS133494 and 66 West/30 North SS133394) Due to the relatively low activities detected with the FIDLER at anomaly K 57A the collection of surface soil samples was not warranted

One sample (55133894) was collected from FIDLER anomaly M 14A at the Surface Disturbance South of the Ash Pits (Figure 2 17) As discussed in Section 2 2 4 3 a relatively high activity of plutonium 239/240 was detected in a surface soil sample collected from the Surface Disturbance West of IHSS 209 (sample SS50075AS) The plutonium 239/240 activity detected at this location was the primary reason that additional radiological surveys and surface soil sampling were necessary at these sites Although the HPGe survey did not detect americium 241 and plutonium 239/240 in the vicinity of this location an additional surface soil sample was collected at this location (Figure 2 16) as a verification and quality control check

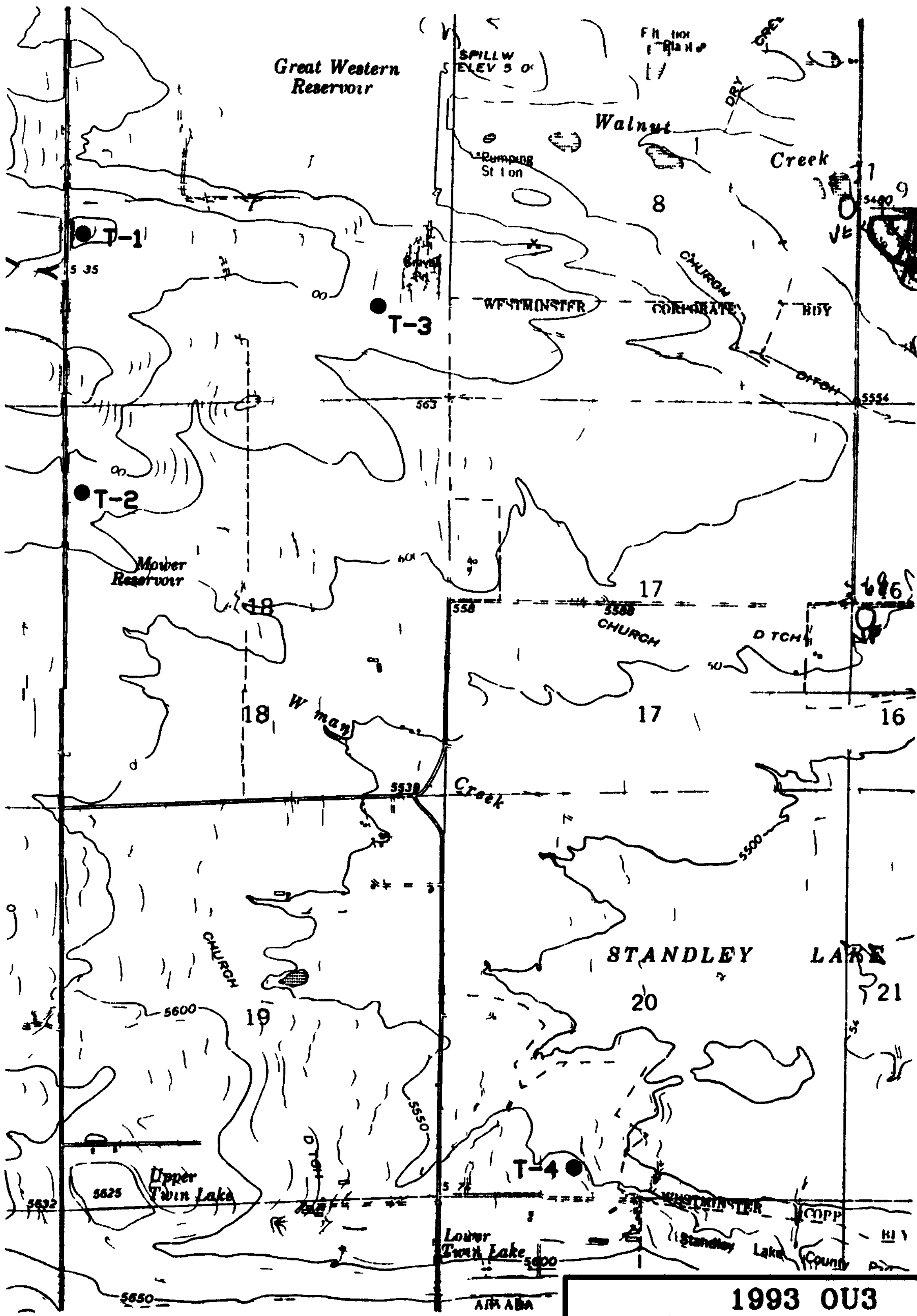
Detected activities in these surface soil samples were within the range of activities of previous work (Section 2 2 4 3) However both plutonium 239/240 and americium 241 activities typically exceeded all but the highest activity from previous soil samples (Table 2 13) None of these samples had activities that exceed the lognormal background UTL (7 66 pC/g for americium 241 and 25 86 pCi/g for plutonium 239/240)

Air Monitoring TM15 (DOE 1994a) described an investigation for estimating the wind resuspension potential of surface soil However the potential for resuspension of contaminated soil was not directly addressed in the investigation of IHSS 209 and the surface disturbances To make this evaluation requires an estimation of the corrected threshold friction velocity of the soil The phased investigation procedures to acquire corrected threshold friction velocity data for IHSS 115 are applicable to IHSS 209 and the surface disturbances and are discussed in Section 2 2 1 7

## 2 2 5 Environmental Evaluation/Ecological Risk Assessment Investigation

Section 9 of the Work Plan Environmental Evaluation Plan was designed to describe the requirements for carrying out an ecological risk assessment, (ERA) The initial field sampling plan (FSP) was intended for screening purposes and baseline site characterization The overall ERA Work Plan Described an iterative approach with revisions planned after chemicals of concern receptors and contaminant pathways were identified The Work Plan Section 9 was modified in February 1993 The 1993 revised FSP was transmitted to the EPA and CDPHE by the DOE but approval of the document was not requested and the regulatory agencies did not provide a formal review or approval

In October of 1994 the approach to ERAs for the Site changed from an OU bases approach to a watershed approach for Woman Creek and Walnut Creek. To accomplish this a sitewide ERA methodology was drafted and approved by the regulatory agencies As a result the scope of the Woman Creek ERA expand from OU 5 to include OU 1 part of OU 2 and part of OU 11 The modified field sampling plans for the OUs encompassed by the watershed ERAs are located in Appendix N and are not duplicated here

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**1993 OU3**
**WIND TUNNEL STUDY**
**TERRESTRIAL SAMPLING SITES**

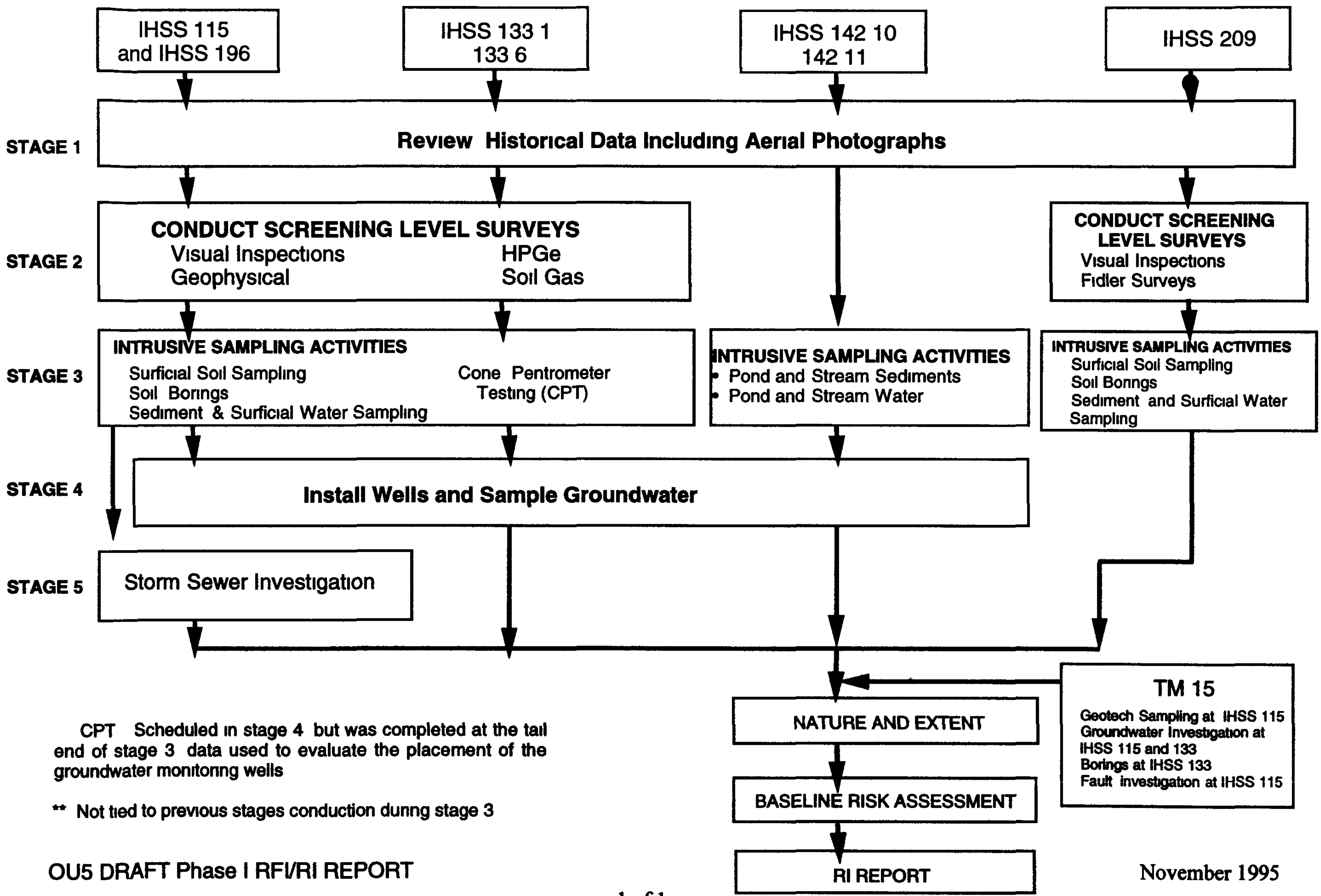
**ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE**

**OU5 - WOMAN CREEK PRIORITY DRAINAGE**

**RFI/RI REPORT**

**FIGURE 2-5**

# FIGURE 2-18 - INVESTIGATIVE STAGES OF THE OU5 FIELD SAMPLING PLAN




CPT Scheduled in stage 4 but was completed at the tail end of stage 3 data used to evaluate the placement of the groundwater monitoring wells

** Not tied to previous stages conduction during stage 3

## Table 2 1

## Evaluvation of Intrinsic Air Permeability

| SOIL BOREHOLES | | | | | | | SOIL GAS SURVEY RESULTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location Code | State Plan Coordinates | | Sample No | Interval | | Soil Description | REEDS Location Code | Coordinates | | Soil Gas Sample Number | Depth (ft) | Intrinsic Air Permeability k (darcy) | Corresponding Soil Type From Report |
| | Northing | Easting | | Top | Bot | | | Northing | Easting | | | | |
| 61293 | 747522.5 | 081148 | BH50509AS | 3.35 | 3.6 | Gravelly sand w/ silt | 504093 | 747595 | 2081130 | SG 50040 AS | 5.0 | 0.03 | Clayey |
| | | | BH50510AS | 5.25 | 5.5 | Gravelly sand w/ silt | 503993 | 747595 | 2081170 | SG 50039 AS | 5.1 | 0.03 | Clayey |
| No associated borehole | | | | | | | 501093 | 747595 | 2082250 | SG 50010 AS | 5.0 | | |
| | | | | | | | 500993 | 747595 | 2082290 | SG 50009 AS | 5.1 | | |
| | | | | | | | 500893 | 747595 | 2082330 | SG 50008 AS | 5.1 | | |
| | | | | | | | 500893 | 747595 | 2082330 | SG 50387 AS | 5.0 | | |
| No associated borehole | | | | | | | 543393 | 747595 | 2082110 | SG 50433 AS | 4.8 | | |
| | | | | | | | 501393 | 747595 | 2082130 | SG 50013 AS | 5.0 | NA Manual pump | |
| | | | | | | | 501293 | 747595 | 2082170 | SG 50012 AS | 5.1 | | |
| 59793 | 747552.6 | 2082128 | BH50489AS | 2.95 | 3.2 | Sandy clay w/silt | 543393 | 747595 | 2082110 | SG 50433 AS | 4.8 | | |
| | | | BH50490AS | 6.25 | 6.5 | Sandy clay w/silt | 501393 | 747595 | 2082130 | SG 50013 AS | 5.0 | NA Manual pump | |
| | | | | | | | 501293 | 747595 | 2082170 | SG 50012 AS | 5.1 | 0.03 | Clayey |
| 59393 | 747555 | 2081489 | BH50466AS | 2.75 | 3 | Broken cobble to clayey sand | 515293 | 747530 | 2081450 | SG 50152 AS | 5.1 | 0.05 | Clayey |
| | | | BH50467AS | 5.15 | 5.4 | Clayey sand | 515193 | 747530 | 2081490 | SG 50151 AS | 3.1 | 0.12 | [illegible] |
| | | | | | | | 515093 | 747530 | 2081530 | SG 50150 AS | 3.5 | 0.12 | [illegible] |
| No associated borehole | | | | | | | 542993 | 747595 | 2082030 | SG 50429 AS | 5.0 | | |
| | | | | | | | 542993 | 747595 | 2082030 | SG 50457 AS | 5.0 | | |
| | | | | | | | 501593 | 747595 | 2082050 | SG 50015 AS | 5.0 | NA Manual pump | |
| 59193 | 747569.2 | 2081261 | BH50462AS | 0.05 | 0.3 | Clayey sand | 503793 | 747595 | 2081250 | SG 50037 AS | 5.1 | 0.02 | Clayey sand |
| | | | BH50463AS | 5.35 | 5.6 | Clayey siltstone | 503693 | 747595 | 2081290 | SG 50036 AS | 5.0 | NA Manual pump | |
| 59593 | 747576.8 | 2081786 | BH50541AS | 4.75 | 5 | Clayey sand w/gravel | 502293 | 747595 | 2081770 | SG 50022 AS | 5.0 | NA Manual pump | |
| | | | BH50542AS | 6.95 | 7.2 | Gravelly sand w/clay | 502193 | 747595 | 2081810 | SG 50021 AS | 5.1 | NA Manual pump | |
| 59293 | 747583.9 | 2082143 | BH50445AS | 3.5 | 3.8 | Sandy clay | 501393 | 747595 | 2082130 | SG 50013 AS | 5.0 | NA Manual pump | |
| | | | BH50446AS | 5 | 5.3 | Clayey sand | 501293 | 747595 | 2082170 | SG 50012 AS | 5.1 | 0.05 | Clayey sand |
| No associated borehole | | | | | | | 503793 | 747595 | 2081250 | SG 50037 AS | 5.1 | | |
| | | | | | | | 503693 | 747595 | 2081290 | SG 50036 AS | 5.0 | NA Manual pump | |

## Table 2 1 (Continued)

| SOIL BOREHOLES | | | | | | | SOIL CAS SURVEY RESULTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location Code | State Plane Coordinates Northing | State Plane Coordinates Easting | Sample No. | Int rval Top | Int rval Bot | Soil Description | RFEDS Location Code | ( oordinates Northing | ( oordinates Easting | Soil Gas Sample Number | Depth (ft) | Intrinsic Air P rmeability k (darcy) | Correspondin Soil Type F om R port |
| No associated borehole | | | | | | | 502093 | 747595 | 2081850 | SG 50020 AS | 5 0 | NA Manual pump | |
| | | | | | | | 501993 | 747595 | 2081890 | SG 50019 AS | 5 2 | NA Manual pump | |
| | | | | | | | 501993 | 747595 | 2081890 | SG 50494 AS | 5 ? | NA Duplicate | |
| No assoc ated borehole | | | | | | | 508493 | 747664 | 2080970 | SC 50084 AS | 5 1 | | |
| No associated borehol | | | | | | | 514093 | 747699 | 2080870 | SG 50140 AS | 5 0 | | |
| | | | | | | | 514193 | 747699 | 2080910 | SG 50141 AS | 3 5 | | |
| 63193 | 747696 8 | 2082542 | BH50621AS | ? | 4 | Sandy clay w/silt | 518993 | 747695 | 2082550 | SG 50189 AS | 5 0 | NA Manual pump | |
| | | | BH50622AS | ? | 6 | Clay w/sand & grav l | | | | | | | |
| 61093 | 747764 3 | 2081952 | BH50607AS | ? | 4 | | 532493 | 747770 | 2081900 | SG 50324 AS | 5 0 | NA Manual pu p | |
| | | | BH50608AS | ? | 6 | | 532393 | 747770 | 2082000 | SG 50323 AS | 5 0 | NA Manual pu p | |
| 5109 | 747768 8 | 2081497 | BH50159AS | 3 | 6 | Silty l y w/s nd and gra l | 527093 | 747770 | 2081550 | SG 50270 AS | 5 1 | NA Man al p p | |
| 60?93 | 747816 5 | 081948 | BH50593AS | 4 | ? | Cl yst n | 540593 | 747815 | 2081950 | SG 50405 AS | 5 0 | NA Manual pu p | |
| | | | BH50594AS | 6 | ? | Cl ysto | 540593 | 747815 | 2081950 | SG 50434 AS | 5 0 | NA Manual pun p | |
| 5?4?3 | 747824 2 | 2081536 | BH505 4AS | 0 75 | 1 | Cl y y and | 536693 | 747820 | 2081530 | SG 50366 AS | 3 0 | 0 05 | Cl y y nd |
| | | | BH50525AS | 6 05 | 6 3 | Gravelly sand w/ ilt | 536693 | 747820 | 2081530 | SG 50463 AS | 3 0 | NA Dupli t | |
| | | | | | | | 534793 | 747825 | 2081575 | SG 50347 AS | 5 0 | NA Manual pun p | |
| 50992 | 747842 8 | 2081536 | BH50142AS | 2 | 4 5 | 1 to 3 Sandy grav l w/cobbl silt | 536893 | 747840 | 2081550 | SG 50368 AS | 5 0 | 0 05 | Cl y y d |
| | | | BH50143AS | 4 5 | 6 | Silty sand w/gravel and clay | 534893 | 747845 | 2081555 | SG 50348 AS | 5 0 | NA Man al pu p | |
| | | | | | | | 534893 | 747845 | 2081555 | SG 50444 AS | 5 0 | NA Manual pump | |
| | | | | | | | 526693 | 747845 | 2081575 | SG 50266 AS | 5 1 | | |
| | | | | | | | 526693 | 747845 | 2081575 | SG 50373 AS | 5 0 | | |
| | | | | | | | 534693 | 747845 | 2081595 | SC 50346 AS | 5 0 | NA Manual p n p | |
| 50892 | 747882 4 | 2082279 | BH50127AS | 2 | 4 | S ndy l y w/silt and trace of gravel | 528493 | 747870 | 2082250 | SG 50284 AS | 5 1 | 0 12 | l nd |
| | | | | 4 | 6 | Sandy cl y w/ ilt and trace of gra l | 522293 | 747895 | 2082250 | SG 50222 AS | 5 0 | 0 04 | Cl y y and |
| | | | | | | | 522393 | 747895 | 2082350 | SG 50223 AS | 5 0 | 0 01 | Cl y y nd |
| 50792 | 747886 1 | 2082384 | BH50110AS | 2 | 4 | S ndy gr l w/ ilt obbl s | 522393 | 747895 | 082350 | SC 50223 AS | 5 0 | 0 01 | Cl y y nd |
| | | | BH50109AS | 4 | 6 | S ndy g l w/ lt bbl | 522493 | 747895 | 2082450 | SG 50224 AS | 5 0 | 0 01 | Cl y y nd |

**Table 2 1 (Continued)**

| SOIL BOREHOLES | | | | | | | SOIL GAS SURVEY RESULTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location Cod | Stat Pl n Coordinates Northing | Easting | Sampl No | Int r l Top | Bot | Soil Description | RFEDS Location Cod | C rd nat s Northing | Easting | Soil G Sampl Numbe | Depth (ft) | Intrinsi Air P r abilty k (d r y) | Cor esp di g S il Typ F R p t |
| 58693 | 747843 6 | 2081584 | BH50373AS | 2 8 | 3 1 | G lly l y | 519793 | 747795 | 2081550 | SG 50197 AS | 5 ? | 0 0 | ( l y y |
| | | | | 6 7 | 7 | wast w/gra l | 525993 | 747795 | 2081575 | SG 50?59 AS | 5 0 | NA Man al pu p | |
| | | | | | | | 526093 | 747795 | 2081625 | SG 50260 AS | 3 4 | NA Manual pu | |
| | | | | | | | 537293 | 747800 | 2081600 | SC 50372 AS | 5 0 | NA Manual pu p | |
| | | | | | | | 536493 | 7478 0 | 2081570 | SG 50364 AS | 5 0 | NA Manual p u p | |
| | | | | | | | 536493 | 747820 | 2081570 | SG 50437 AS | 5 0 | NA Manu l pump | |
| | | | | | | | 536793 | 747820 | 2081580 | SG 50367 AS | 5 0 | NA Manual pu p | |
| | | | | | | | 526393 | 747820 | 2081600 | SG 50?63 AS | 4 ) | 0 06 | ( l y y |
| | | | | | | | 534793 | 747825 | 2081575 | SC 50347 AS | 5 0 | NA Man al pu | |
| | | | | | | | 537193 | 747840 | 2081600 | SG 50371 AS | 5 0 | NA Manual pu p | |
| | | | | | | | 526693 | 747845 | 2081575 | SG 50266 AS | 5 1 | 0 07 | ( l y y |
| | | | | | | | 526693 | 747845 | 2081575 | SG 50373 AS | 5 0 | 0 13 | l |
| | | | | | | | 534693 | 747845 | 2081595 | SG 50346 AS | 5 0 | NA Man al pun p | |
| | | | | | | | 534593 | 747865 | 2081575 | SG 50345 AS | 5 0 | NA Manual pu p | |
| | | | | | | | 5345)3 | 747865 | 2081575 | SC 50466 AS | 5 0 | NA D pli at | |
| 584 ) | 7478 )5 | 081( 53 | BH504 AS | 3 15 | 3 4 | ( lly d w/ l y g aph | 5403 )3 | 7478 )5 | 2081630 | SC 50403 AS | 5 0 | 0 04 | ( l y y |
| | | | BH504 3AS | 5 15 | 5 4 | G ph | 521693 | 747895 | 2081650 | SG 50216 AS | 5 0 | 0 06 | ( l y y |
| | | | | | | | 521693 | 747895 | 2081650 | SC 50480 AS | 5 0 | NA Dupl at | |
| 585 )3 | 747912 3 | 081632 | BH504 8AS | 3 15 | 3 4 | S ndy Cl y | 540393 | 747895 | 2081630 | SG 50403 AS | 5 0 | 0 04 | ( l y y |
| | | | BH50429AS | 4 65 | 4 9 | Sandy Cl y | 521693 | 747895 | 2081650 | SC 50216 AS | 5 0 | 0 06 | ( l y y |
| | | | | | | | 521693 | 747895 | 2081650 | SG 50480 AS | 5 0 | NA D pl at | |
| | | | | | | | 535593 | 747915 | 2081610 | SC 50355 AS | 5 0 | 0 08 | ( l y y |
| | | | | | | | 535593 | 747915 | 2081610 | SG 50465 AS | 5 0 | NA Dupl ate | |
| | | | | | | | 534993 | 747915 | 2081630 | SG 50349 AS | 5 0 | NA Manual pun p | |
| | | | | | | | 534993 | 747915 | 2081630 | SG 50435 AS | 5 0 | NA Manual pump | |
| | | | | | | | 540293 | 747915 | 2081650 | SG 50402 AS | 5 0 | 0 10 | l n |
| 50692 | 747914 4 | 2082505 | BH50093AS | 4 | 6 | Clay y sand w/silt and gravel trace of cobbles | 523993 | 747995 | 2082450 | SG 50?39 AS | 5 0 | 0 13 | l n an |
| | | | | | | | 524093 | 747995 | 2082550 | SG 50240 AS | 5 1 | 0 02 | ( lay y n |
| | | | BH50094AS | 6 | 8 | Clay y sand w/silt and gravel trace of cobbles | 522493 | 747895 | 2082450 | SG 50224 AS | 5 0 | 0 01 | ( l y y |
| | | | | | | | 522593 | 747895 | 2082550 | SG 50225 AS | 5 3 | 0 01 | ( l y y s |

Table 2 1 (Continued)

| SOIL BOREHOLES | | | | | | | SOIL GAS SURVEY RESULTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location Code | State Plan Coordinates Northing | State Plan Coordinates Easting | Sample No. | Interval Top | Interval Bot | Soil Description | RFEDS Location Code | Coordinates Northing | Coordinates Easting | Soil Gas Sampl Number | Depth (ft) | Intrinsic Air Permeability k (darcy) | Corresponding Soil Type From Report |
| 58393 | 747929 2 | 2081652 | BH50418AS | 0 | 1 5 | Cl y y sand t 1 0 wa te sand | 533293 | 747920 | 2081650 | SG 50332 AS | 5 0 | NA Manual pui p | |
| | | | BH50419AS | 3 25 | 3 5 | Waste sand metal | 533293 | 747970 | 2081650 | SG 50376 AS | 5 0 | 0 17 | l sand |
| | | | BH50420AS | 6 45 | 6 7 | waste dried paint | 533193 | 747920 | 2081700 | SG 50331 AS | 5 0 | NA Manual pump | |
| | | | | | | | 535093 | 747935 | 2081650 | SG 50350 AS | 4 8 | NA Manual pump | |
| | | | | | | | 535093 | 747935 | 2081650 | SG 50436 AS | 5 0 | NA Man al pu np | |
| | | | | | | | 535793 | 747935 | 2081670 | SG 50357 AS | 5 0 | NA Manual pui p | |
| | | | | | | | 535793 | 747935 | 2081670 | SG 50464 AS | 5 0 | NA D pl t | |
| | | | | | | | 535693 | 747935 | 081630 | SC 50356 AS | 5 0 | 0 10 | l n |
| No associated borehole | | | | | | | 522693 | 747895 | 2082650 | SG 50226 AS | 5 0 | | |
| | | | | | | | 522793 | 747895 | 2082750 | SG 50227 AS | 5 1 | | |
| | | | | | | | 524193 | 747995 | 2082650 | SC 50241 AS | 5 0 | | |
| | | | | | | | 524193 | 747995 | 2082650 | SG 50478 AS | 5 0 | NA Dupl t | |
| | | | | | | | 524293 | 747995 | 2082750 | SG 50242 AS | 5 1 | | |
| 5059 | 748051 | 2082358 | BH50069AS | 2 | 4 | Sa dy g l w/ obbl nd lt | 528993 | 748020 | 2082375 | SC 50289 AS | 4 6 | NA Manual p p | |
| | | | BH50070AS | 4 | 6 | S ndy gra el w/ obbl and s lt | 528893 | 748020 | 2082400 | SG 50288 AS | 5 0 | NA Manual p t p | |
| | | | BH50071AS | 6 | 8 | Sa dy grav l w/cobbles nd silt | 528693 | 748045 | 2082375 | SG 50286 AS | 4 5 | 0 06 | Cl y y n |
| | | | | | | | 528793 | 748045 | 7082400 | SG 50287 AS | 4 6 | 0 06 | Cl y y n |
| | | | | | | | 528593 | 748070 | 2082375 | SC 50285 AS | 5 0 | 0 07 | Cl y y nd |
| | | | | | | | 524493 | 748095 | 2082450 | SC 50244 AS | 3 4 | 0 03 | Cl y y nd |
| 50492 | 748077 2 | 2082461 | BH50044AS | 2 | 4 | Gravelly sand w/cl y and ilt | 523993 | 747995 | 2082450 | SG 50239 AS | 5 0 | 0 13 | l sand |
| | | | BH50045AS | 4 | 6 | Gravelly sand w/clay and ilt | 524093 | 747995 | 2082550 | SG 50240 AS | 5 1 | 0 07 | Clay y sand |
| | | | | | | | 524493 | 748095 | 2082450 | SG 50244 AS | 3 4 | 0 03 | Cl y y and |
| | | | | | | | 524593 | 748095 | 2082550 | SG 50245 AS | 3 6 | 0 06 | Cl y y sand |
| 50392 | 748088 3 | 2082630 | BH50019AS | 3 | 4 5 | Sand nd silt | 524093 | 747995 | 7082550 | SG 50240 AS | 5 1 | 0 0 | Cl y y san l |
| | | | BH50020AS | 4 5 | 5 8 | Sand nd silt | 524193 | 747995 | 2082650 | SG 50241 AS | 5 0 | 0 02 | Cl y y and |
| | | | | | | | 524193 | 747995 | 2082650 | SG 50478 AS | 5 0 | NA Dupli t | |
| | | | | | | | 524593 | 748095 | 2082550 | SG 50245 AS | 3 6 | 0 06 | Cl y y l |
| | | | | | | | 524693 | 748095 | 2082650 | SG 50246 AS | 5 0 | 0 05 | Cl y y s n l |

Table 2 2A

Summary of Boreholes and Wells Installed Under TM 15

| Location | TM15 Program | Type | Measuring Point (ft. MSL) | Ground Surface Elevation (ft. MSL) | Screen Interval (ft) | Total Depth (ft) | Depth to Bedrock (ft) | IHSS/Site | Bedrock Type |
|---|---|---|---|---|---|---|---|---|---|
| 56794 | Geotech | Borehole | | 5,995 20 | | 25 | 14 | 115/196 | Claystone with Some Silt |
| 56894 | Geotech | Borehole | | 5 994 20 | | 33 | 7 5 | 115/196 | Sandy Siltstone |
| 56994 | Geotech | Monitoring Well | 6 021 63 | 6 019 80 | 14 5-24 5 | 29 | 24 45 | 115/196 | Claystone |
| 57094 | Geotech | Monitoring Well | 5 972 12 | 5 970 20 | 24 34 | 37 5 | 34 | 115/196 | Claystone with Some Silt |
| 57194 | Geotech | Monitoring Well | 6 000 02 | 5 998 10 | 119-129 | 150 | 5 3 | 115/196 | Claystone with Some Silt |
| 57394 | Geotech | Borehole | | 5 938 20 | | 23 | 7 4 | 115/196 | Claystone with Trace Silt |
| 57494 | Geotech | Borehole | | 5,971 40 | | 36 5 | 10 5 | 115/196 | Claystone |
| 57694 | Geotech | Borehole | | 5,946 20 | | 36 5 | 4 | 115/196 | Claystone |
| 57794 | Geotech | Borehole | | 5,985 90 | | 29 | 6 4 | 115/196 | Claystone with Trace Silt |
| 58394 | Geotech | Monitoring Well | 5,999 54 | 5,997 60 | 3 4 5 4 | 9 5 | 5 3 | 115/196 | Claystone |
| 58994 | Geotech | Borehole | | 5 952 10 | | 19 3 | 4 5 | 115/196 | Claystone |
| 59094 | Geotech | Borehole | | 5 951 80 | | 17 | 11 5 | 115/196 | Claystone with Some Silt |
| 59194 | Geotech | Monitoring Well | 6 039 74 | 6 037 70 | 24 34 | 46 | 33 4 | 115/196 | Claystone |
| 59294 | Geotech | Monitoring Well | 5 982 73 | 5,980 80 | 12 17 | 32 | 14 | 115/196 | Sandy Claystone |
| 59594 | Geotech | Monitoring Well | 6,048 91 | 6 046 70 | 27 6 37 6 | 41 | 37 5 | 115/196 | Claystone |
| 59694 | Geotech | Monitoring Well | 5 999 00 | 5 997 00 | 6-16 | 20 | 16 1 | 115/196 | Claystone |
| 59794 | Geotech | Monitoring Well | 6,008 88 | 6,006 40 | 11 21 | 25 2 | 15 5 | 115/196 | Claystone with Trace Silt |
| 71194 | Geotech | Monitoring Well | 6,008 67 | 6,006 20 | 87 5-97 5 | 150 | 16 | 115/196 | Claystone |
| 71294 | Geotech | Borehole | | 5,934 40 | | 34 3 | 7 2 | 115/196 | Claystone |
| 71494 | Geotech | Monitoring Well | 5,999 80 | 5,997 70 | 34-40 | 48 1 | 5 3 | 115/196 | Claystone with Some Silt |
| 55394 | Groundwater | Small Diameter Well | 6,023 55 | 6,021 60 | 3 5-8 5 | 12 | 6 8 | Woman Creek | Claystone with Some Silt |
| 55794 | Groundwater | Small Diameter Well | 6,010 56 | 6,007 80 | 3-8 | 8 | Not Encountered | 133 4 | Not Encountered |
| 56294 | Groundwater | Small Diameter Well | 6,018 49 | 6,017 30 | 6-16 | 16 | 8 9 | 133 3 | Sandy Claystone |
| 56394 | Groundwater | Borehole | | 5,983 60 | | 6 | Not Encountered | Woman Creek | Not Encountered |
| 56494 | Groundwater | Small Diameter Well | 6,012 69 | 6,011 70 | 4 14 | 14 | 10 | 133.2 | Claystone with Some Silt |
| 56594 | Groundwater | Small Diameter Well | 5 970 85 | 5,969 60 | 3-8 | 10 | 6 8 | Woman Creek | Silty Claystone |
| 56694 | Groundwater | Borehole | | 5 962 90 | | 150 7 | 14 | 115/196 | Claystone with Trace Silt |
| 57594 | Groundwater | Monitoring Well | 5 948 43 | 5,946 20 | 79 9-89 9 | 104 9 | 16 5 | 115/196 | Claystone |
| 57894 | Groundwater | Small Diameter Well | 5 950 01 | 5 949 90 | 5-10 | 10 | Not Encountered | 115/196 | Not Encountered |
| 57994 | Groundwater | Small Diameter Well | 5 941 27 | 5 939 80 | 2 7 | 11 | 7 | 115/196 | Claystone |

Table 2-2A (Continued)

| Location | TM15 Program | Type | Measuring Point (ft. MSL) | Ground Surface Elevation (ft. MSL) | Screen Interval (ft) | Total Depth (ft) | Depth to Bedrock (ft) | IHSS/Site | Bedrock Type |
|---|---|---|---|---|---|---|---|---|---|
| 58094 | Groundwater | Small Diameter Well | 5 930 91 | 5,929 60 | 3-8 | 12 | 10 | 115/196 | Claystone with Some Silt |
| 58194 | Groundwater | Small Diameter Well | 5,930 63 | 5,928 60 | 3-8 | 8 | 6 6 | 115/196 | Claystone with Trace Silt |
| 58294 | Groundwater | Small Diameter Well | 5,948 81 | 5,947 10 | 2 5 | 9 | 3 | 115/196 | Claystone |
| 58494 | Groundwater | Small Diameter Well | 5,996 38 | 5,994 80 | 5-10 | 13 | 12 | 115/196 | Claystone |
| 58594 | Groundwater | Small Diameter Well | 5,920 14 | 5 917 90 | 1-6 | 8 | 5 4 | 115/196 | Claystone with Some Silt |
| 58694 | Groundwater | Small Diameter Well | 5,959 96 | 5,958 50 | 2 5 | 9 | 2 2 | 115/196 | Claystone |
| 58794 | Groundwater | Small Diameter Well | 5,958 91 | 5,957 60 | 2 5 | 9 | 1 95 | 115/196 | Claystone |
| 59394 | Groundwater | Monitoring Well | 5,966 96 | 5 965 30 | 77 5-87 5 | 88 3 | 14 | 115/196 | Claystone |
| 59494 | Groundwater | Borehole | | 6 026 20 | | 19 9 | 11 9 | 115/196 | Sandy Siltstone |
| 59894 | Groundwater | Monitoring Well | 6,028 34 | 6,025 70 | 105 1 120 1 | 132 5 | 11 9 | 115/196 | Claystone with Some Silt |
| 71394 | Groundwater | Monitoring Well | 5 985 89 | 5,983 80 | 5 6-10 6 | 13 6 | 10 5 | Woman Creek | Claystone with Trace Silt |
| 55194 | TDEM | Small Diameter Well | 6,048 69 | 6 046 10 | 9-19 | 19 | 16 1 | TDEM 1 | Claystone with Trace Silt |
| 55294 | TDEM | Borehole | | 6 045 30 | | 20 | 15 25 | TDEM 1 | Claystone with Trace Silt |
| 55494 | TDEM | Small Diameter Well | 6 026 88 | 6 026 00 | | 14 | Not Encountered | 133 4 | Not Encountered |
| 55594 | TDEM | Small Diameter Well | 6 033 80 | 6 032 40 | 3-8 | 8 | 4 | 133 4 | Claystone |
| 55694 | TDEM | Borehole | | 6 037 40 | | 16 | 10 6 | 133 4 | Claystone |
| 55894 | TDEM | Borehole | | 6 040 70 | | 12 | 6 4 | TDEM 2 | Claystone |
| 55994 | TDEM | Borehole | | 6 040 30 | | 16 | Not Encountered | TDEM 2 | Not Encountered |
| 56094 | TDEM | Borehole | | 6,038 70 | | 22 | Not Encountered | TDEM 2 | Not Encountered |
| 56194 | TDEM | Borehole | | 6,074 70 | | 30 | 28 | Concrete Pad | Claystone with Some Silt |
| 58894 | TDEM | Borehole | | 6 044 00 | | 8 | 2 7 | TDEM W133 | Claystone |
| 59994 | TDEM | Borehole | | 6 043 20 | | 12 | Not Encountered | TDEM 1 | Not Encountered |
| 60094 | TDEM | Borehole | | 6,042 80 | | 10 | Not Encountered | TDEM 1 | Not Encountered |
| 57294 | Treat | Borehole | | 6 027 20 | | 8 | Not Encountered | 133 1 | Not Encountered |

**Table 2 2B**
**TCLP Extraction Results IHSS 133 2 (Location 57294)**

| | Total (mg/Kg) | TCLP #1 (mg/L) | TCLP #2 (mg/L) | TCLP #3 (mg/L) | TCLP #4 (mg/L) | TCLP #5 (mg/L) |
|---|---|---|---|---|---|---|
| Aluminum | 1 486 6B | 0 35B | 0 66B | 0 3U | 0 3U | 0 3U |
| Antimony | 29 3 | 0 3U | 0 3U | 0 3U | 0 3U | 0 3U |
| Arsenic | 24 3 | 0 2U | 0 2U | 0 2U | 0 2U | 0 2U |
| Barium | 337 9B | 1 18B | 1 36B | 1 27B | 1 52B | 1 37B |
| Beryllium | 82 4B | 0 09B | 0 12B | 0 06B | 0 13B | 0 06B |
| Cadmium | 64 8 | 0 68B | 0 63B | 0 67B | 0 79B | 0 82B |
| Calcium | 1 438 7B | 227 34B | 309 97B | 437 5B | 387 61B | 331 34B |
| Chromium | 140 3 | 0 05U | 0 05U | 0 05U | 0 05U | 0 05U |
| Cobalt | 16 7B | 0 05U | 0 07U | 0 05U | 0 05B | 0 05U |
| Copper | 1 394 3B | 3 77B | 9 07B | 4 64B | 4 67B | 2 69B |
| Iron | 62 263 7B | 0 2U | 0 28B | 0 2U | 0 2U | 0 22B |
| Lead | 825 | 0 22B | 0 51B | 0 26B | 18 5 | 0 87B |
| Magnesium | 3 376 3B | 26 76B | 30 9B | 33 71B | 35 04B | 28 66B |
| Manganese | 525 1B | 1 63B | 2 39B | 1 68B | 1 5B | 1 17B |
| Molybdenum | 14 3B | 0 1U | 0 1U | 0 1U | 0 1U | 0 1U |
| Nickel | 195B | 0 29B | 0 22B | 0 27B | 0 21B | 0 22B |
| Phosphorus | 974 6B | 0 5U | 0 5U | 0 5U | 0 5U | 0 5U |
| Selenium | 80 8 | 0 5U | 0 5U | 0 5U | 0 5U | 0 51B |
| Silver | 89 9B | 0 03U | 0 03U | 0 03U | 0 03U | 0 03U |
| Strontium | 54 1B | 0 97B | 1 11B | 1 29B | 1 29B | 1 08B |
| Thallium | 29 U | 0 3U | 0 35B | 0 31B | 0 54B | 0 3U |
| Titanium | 282 7B | 0 02U | 0 02U | 0 02U | 0 02U | 0 02U |
| Vanadium | 61 3B | 0 5U | 0 5U | 0 5U | 0 5U | 0 5U |
| Zinc | 1 428 3B | 7 34B | 10 55B | 7 7B | 8 05B | 8 21B |

Qualifiers B=appears in blank
U=Contract detection limit

## Table 2 3

## Summary Statistics for Metals Data from Subsurface Soil Samples

| Constituent (COCs are Bold/Italic) | OU 5 or Background Data | Number f Samples | Range of Reporting Limits (mg/kg) | P rcent Detection | R ge of N -detected Concentrations (mg/kg) | R ge of Detected Concentrations (mg/kg) | Mean Concentration (mg/kg) | Standard Deviat |
|---|---|---|---|---|---|---|---|---|
| Alumnum | Background | 98 | 40 504 | 98 98 | 7 690 | 279 102 000 | 12 712 80 | 11 334 96 |
| | Geotech | 26 | 200 | 100 | N/A | 5 710 12 400 | 8 514 04 | 1 699 63 |
| | 115-GW | 25 | 40 200 | 100 | N/A | 2 350 20 700 | 9 779 40 | 4640 47 |
| | 133-TDEM | 22 | 6 36 -- 200 | 100 | N/A | 4 660 -- 28 600 | 11 776 82 | 5 738 99 |
| | Pre-TM15 | 239 | 40 | 100 | N/A | 1 740 -- 32 800 | 10 839 58 | 5 630 95 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | 10,626 92 | 2% |
| ***Antimony*** | Background | 66 | 12 29 1 | 15 15 | 1 9 47 | 2 35 -- 8.2 | 4 54 | 3 66 |
| | Geotech | 2 | 60 | 100 | N/A | 6 2 13 6 | 9 90 | 5 23 |
| | 115-GW | 15 | 12 60 | 0 | 6 30 | N/A | 23 60 | 10 99 |
| | 133-TDEM | 18 | 0 43 60 | 22 | 0 22 -- 30 | 0 57 16 3 | 20 03 | 13 30 |
| | Pre-TM15 | 223 | 12 | 12 11 | 12 22 1 | 6 7 149 | 8 49 | 11 05 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | 10 18 | 20% |
| Arsenic | Background | 99 | 2 4 9 | 70 71 | 0.54 17 9 | 0 92 -- 41 8 | 3 65 | 4 42 |
| | Geotech | 26 | 10 | 100 | N/A | 2 9 16 8 | 6 61 | 2 69 |
| | 115-GW | 25 | 2 10 | 100 | N/A | 1 8 -- 9 4 | 5 63 | 1 64 |
| | 133-TDEM | 22 | 0 644 -- 10 | 100 | N/A | 2 3 14 9 | 5 70 | 3 31 |
| | Pre-TM15 | 239 | 2 | 99 58 | 2 | 0 47 18 9 | 3 91 | 2 40 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | 4 40 | 13% |
| Barium | Background | 99 | 40 96.8 | 88 89 | 25 8 50 1 | 18 8 -- 777 | 96 12 | 96 62 |
| | Geotech | 26 | 200 | 100 | N/A | 81.9 162 | 112 67 | 21 71 |
| | 115-GW | 25 | 40 200 | 100 | N/A | 35 9 -- 203 | 126 03 | 45 1 |
| | 133-TDEM | 22 | 2 15 200 | 100 | N/A | 27 9 1 610 | 187 05 | 327 34 |
| | Pre-TM15 | 239 | 40 | 100 | N/A | 26 6 -- 683 | 130 30 | 92 10 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | 132 49 | 2% |
| ***Beryllium*** | Background | 99 | 1 0 -- 2 4 | 81 82 | 0 91 5 2 | 1 0 23.5 | 4 66 | 4 77 |
| | Geotech | 26 | 5 | 100 | N/A | 0.54 0 96 | 0 74 | 0 10 |
| | 115-GW | 25 | 1 5 | 84 | 0 5 1 3 | 0 33 -- 1 1 | 0 81 | 0 28 |
| | 133-TDEM | 20 | 0.215 -- 5 | 95 | 0 5 | 0.29 -- 446 | 24 35 | 99 37 |
| | Pre-TM15 | 239 | 1 | 69 46 | 1 1 25 | 0 23 -- 131 | 1 48 | 8 46 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | 2 84 | 92% |
| ***Cadmium*** | Background | 81 | 1 2 4 | 7 41 | 0 18 2 4 | 1 1 -- 1.5 | 0 58 | 0 30 |
| | Geotech | 26 | 5 | 3 85 | 2.5 2 5 | 0.56 0 56 | 2 43 | 0 38 |
| | 115-GW | 24 | 1 5 | 0 | 0 5 2 5 | N/A | 2 17 | 0 76 |
| | 133-TDEM | 24 | 0.644 -- 5 | 33 | 0 5 2 5 | 1 4 -- 71 | 7 84 | 15 28 |
| | Pre-TM15 | 239 | 1 | 11 3 | 1 1 32 | 0 62 -- 56 9 | 1 45 | 5 75 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | 2 08 | 43% |
| Calcium | Background | 99 | 110 -- 2 420 | 98 99 | 1 160 | 1 170 157 000 | 7 052.58 | 16 178 79 |
| | Geotech | 26 | 5 000 | 100 | N/A | 3,240 20 400 | 7 821.92 | 3 901 68 |
| | 115-GW | 25 | 1 000 -- 5 000 | 100 | N/A | 1 730 -- 14 000 | 6 580 00 | 2 993 72 |
| | 133-TDEM | 23 | 4.89 -- 5 000 | 100 | N/A | 1 140 -- 18 900 | 4 153 48 | 3 841 19 |
| | Pre-TM15 | 239 | 1 000 | 99 58 | 1 000 | 1,080 -- 35 000 | 5 462 93 | 4 228 23 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | 5,651 89 | 3% |
| Cesium | Background | 95 | 2.5 484 | 1 05 | 163.5 2 830 | 274 | 130.37 | 135 15 |
| | Geotech | 26 | 1 000 | 23 08 | 500 500 | 4.2 19 4 | 386.37 | 211 58 |
| | 115-GW | 24 | 200 -- 1 000 | 4 | 100 500 | 8 7 | 412.86 | 174 35 |
| | 133-TDEM | 24 | 5 09 1000 | 33 | 100 500 | 4 3 18 7 | 319 67 | 238.5 |
| | Pre-TM15 | 212 | 200 | 2 36 | 200 | 1 9 12 6 | 97 80 | 14 17 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | 169 09 | 73% |
| Chromium | Background | 99 | 2 4 8 | 84.85 | 4 1 17 8 | 5 6 176 | 18 75 | 24 66 |
| | Geotech | 26 | 10 | 100 | N/A | 5 3 163 | 24 94 | 32 88 |
| | 115-GW | 25 | 2 10 | 100 | N/A | 3.8 48.9 | 14 60 | 9 01 |
| | 133-TDEM | 22 | 0 644 -- 10 | 100 | N/A | 7 434 | 37.54 | 89 42 |
| | Pre-TM15 | 239 | 2 | 99 58 | 5 6 | 2 7 8 310 | 51.20 | 538 73 |
| | | | | | | Mean of OU 5 Data and Percent Ch nge from Pre-TM15 Mean -- | 45 12 | 12% |
| Cobalt | Background | 99 | 10 24.2 | 22.22 | 3 8 93 9 | 4 5 16 4 | 6 45 | 7 11 |
| | Geotech | 26 | 50 | 100 | N/A | 3 9 12 6 | 8 32 | 2 10 |
| | 115-GW | 25 | 10 -- 50 | 100 | N/A | 3 13 2 | 7 76 | 2 45 |
| | 133-TDEM | 24 | 1 29 -- 50 | 96 | 5 | 2 3 701 | 36.55 | 141 60 |
| | Pre-TM15 | 239 | 10 | 96 65 | 10 | 2 1 67 6 | 8 86 | 6 33 |
| | | | | | | Mean of OU 5 Data and Percent hange f om Pre-TM15 Mean -- | 10 84 | 22% |

## Table 2 3 (Continued)

| Constituent (COCs are Bold/Italic) | OU 5 or Background Data | Number of Samples | Range of Reporting Limits (mg/kg) | Percent Detection | Range of Non-detected Concentrations (mg/kg) | Range of Detected Concentrations (mg/kg) | Mean Concentration (mg/kg) | Standard Deviation |
|---|---|---|---|---|---|---|---|---|
| Copper | Background | 99 | 5 12 1 | 94 95 | 5 11 | 2.2 123 | 12.59 | 12 77 |
| | Geotech | 26 | 25 | 100 | N/A | 13 9 31 2 | 21 92 | 3 95 |
| | 115-GW | 25 | 5 25 | 80 | 12 5 17 45 | 8 8 42 4 | 19.25 | 6 83 |
| | 133-TDEM | 24 | 0 43 25 | 96 | 7 1 | 5 6 8,850 | 601 63 | 1 843.23 |
| | Pre-TM15 | 239 | 5 | 98 74 | 5 10 25 | 3 6 6,920 | 82 45 | 501 93 |
| | Mean of OU 5 Data and Percent Cha ge from Pre-TM15 Mean | | | | | | 112 09 | 36% |
| Iron | Background | 99 | 20 252 | 100 | N/A | 1 300 132 000 | 14 531 98 | 13,257.27 |
| | Geotech | 26 | 100 | 100 | N/A | 5 820 25 800 | 17 821 92 | 4 496 93 |
| | 115-GW | 25 | 20 100 | 100 | N/A | 7 020 -- 24 000 | 16 833 00 | 4 656 74 |
| | 133-TDEM | 24 | 1 47 100 | 100 | N/A | 6 460 106 000 | 23 430 42 | 25 540 06 |
| | Pre-TM15 | 239 | 20 | 100 | N/A | 2,340 107,000 | 18 383 49 | 12 090 96 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 17,077 00 | 4 |
| Lead | Background | 99 | 1 6 1 | 98 99 | 4 | 2 6 39 8 | 10.85 | 7 07 |
| | Geotech | 26 | 3 | 100 | N/A | 6 5 21 | 16 82 | 3 47 |
| | 115-GW | 25 | 0 6 3 | 100 | N/A | 5 3 22 3 | 15 20 | 4 67 |
| | 133-TDEM | 22 | 0 43 3 | 100 | N/A | 3 9 5,200 | 316.50 | 1 106 69 |
| | Pre-TM15 | 239 | 0 6 15 | 100 | N/A | 2 9 935 | 31 49 | 98 39 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 49 06 | 56% |
| Lithium | Background | 99 | 2 1 26 1 | 61 62 | 2 9 26 1 | 3 7 83.2 | 9 99 | 8 51 |
| | Geotech | 26 | 100 | 100 | N/A | 3 6 10.9 | 7 41 | 1 88 |
| | 115-GW | 25 | 20 100 | 92 | 10 | 2 45 -- 15 7 | 8 97 | 3 88 |
| | 133-TDEM | 24 | 2 58 -- 100 | 96 | 10 10 | 2 8 17 9 | 8.57 | 4 44 |
| | Pre-TM15 | 237 | 20 | 85 65 | 20 | 1 4 -- 29 | 8 55 | 4 79 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 8 49 | 1% |
| Magnes um | Background | 99 | 110 2 420 | 95 96 | 713 -- 1 175 5 | 1 180 -- 32,500 | 2,852.83 | 3,248 35 |
| | Geotech | 26 | 5 000 | 100 | N/A | 1 450 5 480 | 3,289 42 | 1 024 00 |
| | 115-GW | 25 | 1 000 5 000 | 100 | N/A | 882 5 335 | 3,243.08 | 1 193.54 |
| | 133-TDEM | 24 | 7 52 5 000 | 100 | N/A | 828 -- 9 480 | 2 782.38 | 1 875.29 |
| | Pre-TM15 | 239 | 1,000 | 100 | N/A | 392 -- 6,900 | 2,788.53 | 1,353.51 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 2,882.67 | 3% |
| Manganese | Background | 99 | 3 7 3 | 100 | N/A | 37 3,330 | 217 64 | 341 96 |
| | Geotech | 26 | 15 | 100 | N/A | 41 7 486 | 281.99 | 120 60 |
| | 115-GW | 25 | 3 15 | 100 | N/A | 102 488 | 250 46 | 118 97 |
| | 133-TDEM | 22 | 0.245 15 | 100 | N/A | 42.2 2 150 | 300.06 | 450.27 |
| | Pre-TM15 | 239 | 3 | 100 | N/A | 26 4 1,540 | 261 81 | 245 07 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 265.28 | 1% |
| Mercury | Background | 86 | 0 08 0 3 | 25 58 | 0 05 5 9 | 0 1 0 64 | 0 19 | 0 34 |
| | Geotech | 26 | 0.2 | 42 31 | 0 1 0 1 | 0 064 0 1 | 0 09 | 0 01 |
| | 115-GW | 24 | 0 1 0.2 | 33 | 0 05 0 1 | 0 06 0 11 | 0 09 | 0 02 |
| | 133 TDEM | 18 | 0 1 -- 0.2 | 44 | 0 1 | 0 06 -- 0 36 | 0 11 | 0 08 |
| | Pre-TM15 | 223 | 0 1 | 21 52 | 0 1 0 13 | 0 05 -- 1 4 | 0 09 | 0 16 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 0 09 | 1% |
| ***Molybden m*** | Background | 99 | 2 1 -- 40 | 50 51 | 2 28 9 | 2 5 67 6 | 10 90 | 8 61 |
| | Geotech | 26 | 200 | 30 77 | 100 100 | 1 2 3.5 | 69.84 | 46 13 |
| | 115-GW | 24 | 40 200 | 25 | 20 100 | 1 3 7 1 | 65 73 | 45 49 |
| | 133-TDEM | 24 | 3 44 -- 200 | 33 | 1 75 100 | 1 6 470 | 83.76 | 92 78 |
| | Pre-TM15 | 238 | 40 | 8 4 | 40 | 0 9 190 | 20 19 | 13 73 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 32 72 | 62% |
| Nickel | Background | 96 | 8 19 4 | 85 42 | 9 4 52 1 | 4 3 193 | 19.81 | 20.56 |
| | Geotech | 26 | 40 | 100 | N/A | 8 3 37 | 19.55 | 6 21 |
| | 115-GW | 25 | 8 40 | 88 | 16 4 24 3 | 4 5 102 | 22.54 | 20 62 |
| | 133-TDEM | 24 | 2.58 -- 40 | 100 | N/A | 6 6 355 | 50.99 | 82.86 |
| | Pre-TM15 | 239 | 8 | 95 4 | 8 9 9 | 2 7 4 750 | 37.58 | 308.57 |
| | Mean of OU 5 Data and Percent Ch nge from Pre-TM15 Mean -- | | | | | | 35.91 | -4% |
| Potassium | Background | 98 | 110 2 420 | 52 04 | 373 15 400 | 654 18 700 | 1 403.90 | 2 084.24 |
| | Geotech | 26 | 5 000 | 100 | N/A | 735 1 780 | 1,274.92 | 253 06 |
| | 115-GW | 25 | 1 000 -- 5 000 | 84 | 500 2 140 | 473 3 750 | 1 437 38 | 665 78 |
| | 133-TDEM | 24 | 78.2 5 000 | 96 | 500 | 470 -- 3 030 | 1,218 46 | 593 01 |
| | Pre-TM15 | 239 | 1 000 | 88 7 | 000 558 5 | 327 7,040 | 1,341 99 | 748 86 |
| | Mean of OU 5 D ta and ercent h ng f om Pre-TM15 Mean -- | | | | | | 1,334 59 | 1% |

## Table 2 3 (Continued)

| Constituent (COCs are Bold/Italic) | OU 5 or Background Data | Number f Samples | Range of Reporting Limits (mg/kg) | Percent Detection | Range of N n-detected Concentrations mg/kg) | Range of Detected Concentrations (mg/kg) | Mea Concentration (mg/kg) | ˜ta dard Deviat |
|---|---|---|---|---|---|---|---|---|
| Selenium | Background | 82 | 1 122 | 2 44 | 0 21 13 7 | 2 15 2 8 | 0 91 | 1 15 |
| | Geotech | 26 | 5 | 34 62 | 2 5 2 5 | 0 71 2 5 | 2 00 | 0 77 |
| | 115-GW | 24 | 1 5 | 13 | 0 5 2 5 | 1 1 1 9 | 2 10 | 0 69 |
| | 133-TDEM | 24 | 0 734 19 6 | 13 | 1 1 9 8 | 0 87 6 1 | 3 14 | 2 21 |
| | Pre-TM15 | 233 | 1 | 9 44 | 1 1 4 | 0 24 0 78 | 0 49 | 0 06 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | 0 95 | 94% |
| ***Silver*** | Background | 83 | 1 4 8 | 39 76 | 0 54 6 8 | 1 45 40 9 | 5 57 | 9 46 |
| | Geotech | 26 | 10 | 30 77 | 3 15 5 | 1 3 1 | 3 93 | 1 57 |
| | 115-GW | 25 | 2 10 | 16 | 1 5 | 1 3 2 | 3 77 | 1 73 |
| | 133-TDEM | 20 | 0 644 10 | 65 | 1 5 | 0 59 209 | 20 48 | 47 01 |
| | Pre-TM15 | 203 | 2 | 14 29 | 2 | 0 8 311 | 5 96 | 28 94 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | 6 63 | 11% |
| Sodium | Background | 99 | 110 2 420 | 17 17 | 126 2 720 | 161 3 680 | 303 62 | 421 97 |
| | Geotech | 26 | 5 000 | 80 77 | 2 500 2 500 | 74.5 677 | 675 06 | 917 81 |
| | 115-GW | 25 | 1 000 5 000 | 100 | N/A | 28.2 1 140 | 281 36 | 287 33 |
| | 133-TDEM | 24 | 5 63 5 000 | 92 | 500 2 500 | 54 3 380 | 594 98 | 796.52 |
| | Pre-TM15 | 239 | 1 000 | 94 14 | 1 000 | 42 3,220 | 299 83 | 333 89 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | 351 99 | 17% |
| Strontium | Background | 99 | 21 6 484 | 36 36 | 20 3 484 | 25 1 -- 226 | 52 02 | 48 27 |
| | Geotech | 26 | 200 | 100 | N/A | 21 3 119 | 65 42 | 24 78 |
| | 115-GW | 25 | 40 200 | 100 | N/A | 13 7 -- 111 | 81 10 | 27 32 |
| | 133-TDEM | 22 | 0.245 200 | 100 | N/A | 9 9 92 6 | 30 50 | 22 19 |
| | Pre-TM15 | 239 | 40 400 | 100 | N/A | 6 4 148 | 37 58 | 21 46 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | 41 29 | 10% |
| Thallium | Background | 75 | 2 20 | 4 | 0 18 4 9 | 0.22 0 4 | 0 50 | 0 54 |
| | Geotech | 26 | 10 | 19.23 | 2 91 5 | 0 39 0 78 | 4 07 | 1 79 |
| | 115-GW | 24 | 2 10 | 0 | 1 5 | N/A | 4 33 | 1 52 |
| | 133-TDEM | 24 | 0 734 -- 10 | 17 | 1 5 | 0 5 6 3 | 4 09 | 1 77 |
| | Pre-TM15 | 238 | 2 | 29 41 | 2 | 0 2 0 55 | 0 79 | 0 32 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | 1 59 | 101% |
| Tin | Background | 92 | 10 110 | 27 17 | 20.2 -- 48 4 | 25 7 -- 441 | 62 49 | 112 04 |
| | Geotech | 26 | 200 | 19.23 | 100 100 | 3.2 4 6 | 81 48 | 38 70 |
| | 115-GW | 24 | 40 200 | 4 | 20 100 | 2 8 | 80 66 | 35 06 |
| | 133-TDEM | 24 | 5 16 -- 200 | 38 | 2 62 100 | 8 9 102 | 67 39 | 43 37 |
| | Pre-TM15 | 239 | 40 | 4 6 | 40 | 2 4 579 | 23 10 | 37 16 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | 35 76 | 55% |
| Vanadium | Background | 99 | 10 24.2 | 97 98 | 8 45 11 6 | 11 1 283 | 31 49 | 28 50 |
| | Geotech | 26 | 50 | 100 | N/A | 13 9 36 3 | 22 63 | 4 22 |
| | 115-GW | 25 | 10 50 | 100 | N/A | 8 1 38 7 | 26 35 | 9 59 |
| | 133-TDEM | 24 | 0 644 -- 50 | 100 | N/A | 12.2 60 4 | 31 28 | 12 52 |
| | Pre-TM15 | 239 | 10 | 100 | N/A | 7 6 93.5 | 30 37 | 12 73 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | 29 48 | 3% |
| Zinc | Background | 98 | 4 97 | 92.86 | 9 7 25 9 | 0.52 -- 486 | 36.31 | 51 36 |
| | Geotech | 26 | 20 | 100 | N/A | 18 3 87 1 | 65 04 | 15 58 |
| | 115-GW | 25 | 4 20 | 100 | N/A | 13.8 -- 121 | 58 78 | 22.27 |
| | 133-TDEM | 24 | 0 489 -- 20 | 100 | N/A | 8 6,920 | 441.26 | 1 414 47 |
| | Pre-TM15 | 239 | 4 | 100 | N/A | 7 6 2,390 | 90 38 | 251 58 |
| | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | 112 58 | 25% |

Notes OU 5 data where;

Geotech refers to samples collected from the geotechnical program at IHSS 115 as detailed in TM15

115-GW refers to samples collected from boreholes from the groundwater monitoring program at IHSS 115 as detailed in TM15

133-TDEM refers to samples collected from boreholes used to investigate the TDEM anomalies at IHSS 133 as detailed in TM15

Pre-TM15 refers to samples collected within OU 5 prior to January 1994

Mean and Standard Deviation are calculated assuming data are normally distributed.

mg/kg milligrams per kilogram. N/A not applicable

## Table 2 4
## Summary for Radionuclide Data from Subsurface-Soil Samples

| Constituent (COCs are ***Bold/Italic***) | OU 5 or Background Data | Number of Samples | Range of Activities (pCi/g) | Mean Activity (pCi/g) | Standard Deviation |
|---|---|---|---|---|---|
| **Total Activities** | | | | | |
| Americium 241 | Background | 28 | -0 015 -- 0 01 | -0 002 | 0 007 |
| | Geotech | 24 | -0 0119 0 2572 | 0 033 | 0 065 |
| | 115 GW | 25 | 0 -- 0 08 | 0 01 | 0 02 |
| | 133 TDEM | 21 | 0 0 2 | 0 05 | 0 06 |
| | Pre TM15 | 239 | -0 016 0 61 | 0 014 | 0 053 |
| | Mean of OU 5 Data % Change from Pre-TM15 Mean -- | | | **0 02** | **26%** |
| Plutonium 239/240 | Background | 99 | -0 01 -- 0 03 | 0 004 | 0 007 |
| | Geotech | 24 | -0 0019 0 0382 | 0 007 | 0 009 |
| | 115 GW | 25 | 0 -- 0 08 | 0 01 | 0 02 |
| | 133 TDEM | 25 | 0 5 16 | 0 31 | 1 03 |
| | Pre-TM15 | 231 | -0 03 -- 3 2 | 0 053 | 0 251 |
| | Mean of OU 5 Data % Change from Pre-TM15 Mean -- | | | **0 07** | **26%** |
| ***Uranium-233/234*** | Background | 99 | 0 2 -- 8 9 | 0 779 | 0 932 |
| | Geotech | 24 | 0 78915 1 576 | 1 157 | 0 212 |
| | 115 GW | 29 | 0 58 -- 1 51 | 0 96 | 0 25 |
| | 133 TDEM | 27 | 0 38 288 29 | 25 01 | 70 38 |
| | Pre-TM15 | 244 | 0 35 126 | 3 95 | 15 811 |
| | Mean of OU 5 Data % Change from Pre-TM15 Mean -- | | | **5.23** | **32%** |
| ***Uranium-235*** | Background | 99 | 0 00 -- 0 2 | 0 02 | 0 046 |
| | Geotech | 24 | -0 0031 0 1214 | 0 05 | 0 023 |
| | 115 GW | 29 | 0 01 -- 0 13 | 0 04 | 0 02 |
| | 133-TDEM | 27 | 0 01 -- 36 12 | 2 30 | 7 49 |
| | Pre-TM15 | 245 | -0 006 -- 37 68 | 0 49 | 3 017 |
| | Mean of OU 5 Data % Change from Pre-TM15 Mean -- | | | **0.57** | **16%** |
| ***Uranium-238*** | Background | 99 | 0 2 -- 3 2 | 0 733 | 0 376 |
| | Geotech | 24 | 0 8265 1 576 | 1 150 | 0 192 |
| | 115 GW | 29 | 0 62 -- 1 45 | 0 97 | 0 23 |
| | 133-TDEM | 27 | 0 37 -- 933 04 | 78 59 | 237 96 |
| | Pre-TM15 | 245 | 0 43 -- 1 160 | 17.928 | 113 988 |
| | Mean of OU 5 Data % Change from Pre-TM15 Mean -- | | | **20.22** | **13%** |
| Alpha | Background | 99 | 5 -- 48 | 24 915 | 9 284 |
| | Geotech | 25 | 9 354 19 33 | 13 973 | 2 614 |
| | 115-GW | 29 | 9 59 -- 29 | 15 00 | 5 33 |
| | 133-TDEM | 28 | 5 8 -- 418 28 | 65 76 | 110 61 |
| | Pre-TM15 | 221 | 5 59 -- 742 | 26 573 | 65 713 |
| | Mean of OU 5 Data % Change from Pre-TM15 Mean -- | | | **28.06** | **6%** |
| Beta | Background | 99 | 6 -- 44 | 24 717 | 6 061 |
| | Geotech | 25 | 22 86 37 81 | 27 188 | 2 915 |
| | 115-GW | 29 | 19 78 38 42 | 27 03 | 4 09 |
| | 133 TDEM | 28 | 13 64 898 92 | 115 97 | 216 25 |
| | Pre-TM15 | 222 | 7 5 -- 1 580 | 45 759 | 125 611 |
| | Mean of OU 5 Data % Change from Pre-TM15 Mean -- | | | **48.91** | **7%** |

Notes OU 5 data where

Geotech refers to samples collected from the geotechnical program at IHSS 115 as detailed in TM15.

115 GW refers to samples collected from boreholes from the groundwater mon toring program at IHSS 115 as deta led n TM15

133 TDEM refers to samples collected from boreholes used to investigate the TDEM anomalies at IHSS 133 as detailed in TM15

*Pre-TM15 refers to samples collected within OU5 prior to January 1994*

Mean and Standard Deviation are calculated assuming data are normally distributed.

pCi/g picocuries per gram.

## Table 2 5
## Summary of Detected Organic Compounds in Subsurface-Soil Samples

| TM15 Program* Chemical (COCs are in ***Bold/Italics***) | Number f Samples | Range of Reporting Limits (ug/kg) | Percent of S mples Above Detection Limit TM15 | *Pre-TM15* | Range of Nondetected Concentrations (ug/kg) | Ra ge of D tected oncentrations (ug/kg) | Maximum Con nt atio *PRE TM15* (ug/kg) |
|---|---|---|---|---|---|---|---|
| **Geotech** | | | | V latile Organic Compounds | | | |
| 2-Butanone | 27 | 10 | 7 | *5 1* | 11 31 | 3 40 | *69* |
| Acetone | 27 | 10 | 44 | *9 9* | 12 60 | 17 110 | *280* |
| Chloroform | 27 | 5 10 | 11 | *0* | 2 5 13 | 5 5 14 | *<6 3* |
| Methylene Chlonde | 27 | 5 10 | 41 | *14 4* | 2 5 31 | 3 13 | *66* |
| Tetrachloroethene | 27 | 5 10 | 19 | *13 3* | 2 5 16 | 2 12 | *920* |
| Toluene | 27 | 5 10 | 19 | *45 4* | 2.5 16 | 1 6 | *310* |
| Tnchloroethene | 27 | 5 10 | 11 | *11 3* | 2 5 31 | 1 2 | *440* |
| | | | | Semi-Volatile Organic Compounds | | | |
| Anthracene | 25 | 330 | 4 | *23.2* | 350 1 000 | 212 5 | *46 000* |
| ***Benzo(a)Anthracene*** | ***25*** | ***330*** | ***20*** | ***26 8*** | ***360 -- 1 000*** | ***43 -- 96*** | ***48 000*** |
| ***Benzo(a)Pyrene*** | ***25*** | ***330*** | ***52*** | ***25 6*** | ***365 -- 400*** | ***40 -- 320*** | ***43 000*** |
| ***Benzo(b)Fluoranthene*** | ***25*** | ***330*** | ***20*** | ***26 8*** | ***360 -- 1 000*** | ***75 125*** | ***48 000*** |
| Benzo(k)Fluoranthene | 25 | 330 | 8 | *24 4* | 350 -- 1 000 | 40 44 | *19 000* |
| Bis(2-Ethylhexyl)Phthalate | 25 | 330 | 52 | *15 9* | 203.5 -- 530 | 39 180 | *290* |
| Butly Benzyl Phthalate | 25 | 330 | 92 | *<5* | 360 -- 550 | 94 2 100 | *360* |
| Chrysene | 25 | 330 | 20 | *26 8* | 360 -- 1 000 | 52 115 | *53 000* |
| Di-n-Butyl Phthalate | 25 | 330 | 36 | *<5* | 350 1 000 | 43 215 5 | *300* |
| Diethyl Phthalate | 25 | 330 | 4 | *0* | 350 1 000 | 890 | *330* |
| Fluoranthene | 25 | 330 | 28 | *30 5* | 370 1 000 | 60 260 | *160 000* |
| Indeno(1 2 3-cd)Pyrene | 25 | 330 | 8 | *21* | 350 1 000 | 47 54 | *22 000* |
| Phenanthrene | 25 | 330 | 20 | *31 7* | 365 1 000 | 70 205 | *220 000* |
| Pyrene | 25 | 330 | 28 | *31 7* | 370 1 000 | 46 215 | *150,000* |
| | | | | Pesticides and PCBs | | | |
| ***Aroclor-1254*** | ***18*** | ***33 160*** | ***11*** | ***11 8*** | ***38.5 -- 186*** | ***320 -- 540*** | ***960*** |
| **115-GW** | | | | Volatile Organic Compounds | | | |
| 2-Butanone | 43 | 10 | 2 | *5 1* | 5 27 | 7 | *69* |
| Acetone | 43 | 10 | 14 | *9 9* | 11 190 | 16 56 | *280* |
| Bromoform | 43 | 5 10 | 2 | *0* | 2 5 -- 14 | 2 | *<6 3* |
| Chloroform | 43 | 5 10 | 14 | *0* | 2.5 -- 7 | 2 36 | *<6 3* |
| Methylene Chlonde | 43 | 5 10 | 9 | *14 4* | 2.5 -- 29 | 4 150 | *66* |
| Tetrachloroethene | 43 | 5 10 | 21 | *13 3* | 2 5 14 | 3 30 | *920* |
| Toluene | 43 | 5 10 | 14 | *45 4* | 2.5 -- 14 | 1 3 | *310* |
| Tnchloroethene | 43 | 5 10 | 2 | *11 3* | 2 5 -- 14 | 1 | *440* |
| | | | | Semi-Volatile Organic Compounds | | | |
| ***Benzo(a)Pyrene*** | ***24*** | ***330*** | ***29*** | ***25 6*** | ***350 -- 380*** | ***58 480*** | ***43 000*** |
| Benzoic Acid | 22 | 1 600 | 23 | *21 3* | 1 700 -- 4 300 | 64 210 | *974* |
| Bis(2-Ethylhexyl)Phthalate | 24 | 330 | 46 | *15 9* | 350 390 | 42 540 | *290* |
| Butyl Benzyl Phthalate | 24 | 330 | 17 | *<5* | 350 -- 1 135 | 170 1 400 | *360* |
| Di-n-Butyl Phthalate | 24 | 330 | 8 | *<5* | 350 -- 700 | 120 190 | *300* |
| Di-n-Octyl Phthalate | 24 | 330 | 8 | *0* | 350 890 | 39 -- 50 | *330* |
| Diethyl Phthalate | 24 | 330 | 8 | *0* | 350 -- 890 | 63 305 | *330* |
| Fluoranthene | 24 | 330 | 4 | *30 5* | 350 890 | 39 | *160,000* |
| **133-TDEM** | | | | Volatile Organic Compounds | | | |
| Tetrachloroethene | 1 | 5 | 100 | *13 3* | N/A | 18 | *920* |
| | | | | Semi-Volatile Organic Compounds | | | |
| Benzoic Acid | 2 | 1 600 | 50 | *21 3* | 1 900 | 140 | *974* |
| Bis(2 Ethylhexyl)Phthalate | 2 | 330 | 50 | *15 9* | 380 | 100 | *290* |
| Di-n-Butyl Phthalate | 2 | 330 | 50 | *2 4* | 380 | 190 | *300* |
| Phenanthrene | 2 | 330 | 50 | *31 7* | 380 | 41 | *220 000* |

Notes OU 5 data where;

Geotech refers to samples collected from the geotechnical program at IHSS 115 as detailed TM15

115-GW refers to samples collected from boreholes from the groundwater monitoring program at HSS 115 as detailed n TM15

133-TDEM refers to samples collected from boreholes used to investigate the TDEM a omalies at IHSS 133 as detailed in TM15

Mean and Standard Deviation are calculated assuming data are normally distributed

ug/kg micrograms per kilogram. N/A not applicable.

**Table 2-6**
**TM15 Sampling Summary**

| Location | TM15 Program | Sample Number | QC Code | QC Partner | Sample Type | Completion Type | IHSS | Analyses Requested: Rads | Metals | VOA | SVOA | Pest/PCB | Water Qual | Geotech |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58793 | GW | GW50123AS | REAL | | GW | WELL | 133 | X | X | X | X | X | X | |
| 58793 | GW | GW50124AS | RNS | GW50123AS | GW | WELL | 133 | X | | X | | | X | |
| 59393 | GW | GW50127AS | REAL | | GW | WELL | 115/196 | | X | X | X | X | X | |
| 59393 | GW | GW50134AS | TB | GW50127AS | GW | WELL | 115/196 | | | X | | | | |
| 59493 | GW | GW50113AS | REAL | | GW | WELL | 115/196 | X | X | X | X | X | X | |
| 59493 | GW | GW50113AS | REAL | | GW | WELL | 115/196 | X | X | X | X | X | X | |
| 59493 | GW | GW50114AS | DUP | GW50113AS | GW | WELL | 115/196 | X | X | X | X | X | X | |
| 59493 | GW | GW50114AS | DUP | GW50113AS | GW | WELL | 115/196 | X | X | X | X | X | X | |
| 59593 | GW | GW50131AS | REAL | | GW | WELL | 115/196 | X | X | X | X | X | X | |
| 59793 | GW | GW50133AS | REAL | | GW | WP | 115/196 | | | X | | | X | |
| 59793 | GW | GW50136AS | RNS | GW50133AS | GW | WP | 115/196 | X | X | X | X | X | X | |
| 59893 | GW | GW50222AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 59993 | GW | GW50148AS | REAL | | GW | WP | 115/196 | | | X | | | X | |
| 59993 | GW | GW50224AS | REAL | | GW | WP | 115/196 | | X | | | | X | |
| 60093 | GW | GW50218AS | REAL | | GW | WP | 115/196 | X | X | X | X | | X | |
| 60093 | GW | GW50219AS | TB | GW50218AS | GW | WP | 115/196 | | | X | | | | |
| 60293 | GW | GW50143AS | REAL | | GW | WP | 115/196 | X | X | X | X | X | X | |
| 60293 | GW | GW50144AS | DUP | GW50143AS | GW | WP | 115/196 | X | X | X | X | X | X | |
| 60293 | GW | GW50170AS | REAL | | GW | WP | 115/196 | X | X | X | X | | X | |
| 60293 | GW | GW50171AS | DUP | GW50170AS | GW | WP | 115/196 | X | X | X | X | | X | |
| 60293 | GW | GW50181AS | TB | GW50170-171A | GW | WP | 115/196 | | | X | | | | |
| 60393 | GW | GW50220AS | REAL | | GW | WP | 115/196 | | X | X | | | X | |
| 60393 | GW | GW50221AS | TB | GW50220AS | GW | WP | 115/196 | | | X | | | | |
| 60493 | GW | GW50156AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 60493 | GW | GW50226AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 60593 | GW | GW50155AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 60593 | GW | GW50212AS | REAL | | GW | WP | 115/196 | X | X | X | X | | X | |
| 60593 | GW | GW50213AS | TB | GW50212AS | GW | WP | 115/196 | | | X | | | | |
| 60693 | GW | GW50160AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 60693 | GW | GW50214AS | REAL | | GW | WP | 115/196 | X | X | X | X | | X | |
| 60693 | GW | GW50215AS | TB | GW50214AS | GW | WP | 115/196 | | | X | | | | |
| 60893 | GW | GW50157AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 60893 | GW | GW50158AS | RNS | GW50157AS | GW | WP | 115/196 | | X | | X | | X | |
| 60893 | GW | GW50175AS | REAL | | GW | WP | 115/196 | X | X | X | X | | X | |
| 60993 | GW | GW50210AS | REAL | | GW | MINI | 115/196 | | X | X | | | X | |
| 60993 | GW | GW50211AS | TB | GW50210AS | GW | MINI | 115/196 | | | X | | | | |
| 61093 | GW | GW50150AS | RNS | GW50151AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 61093 | GW | GW50151AS | REAL | | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 61093 | GW | GW50154AS | DUP | GW50151AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 61093 | GW | GW50164AS | TB | GW50151AS | GW | MINI | 115/196 | | | X | | | | |
| 61093 | GW | GW50176AS | REAL | | GW | MINI | 115/196 | X | X | X | X | | X | |
| 61093 | GW | GW50177AS | DUP | GW50176AS | GW | MINI | 115/196 | X | X | X | X | | X | |
| 61093 | GW | GW50194AS | TB | GW50176AS | GW | MINI | 115/196 | | | X | | | | |
| 61293 | GW | GW50125AS | RNS | GW50126AS | GW | WELL | 115/196 | X | X | X | X | X | X | |
| 61293 | GW | GW50126AS | REAL | | GW | WELL | 115/196 | | X | X | | | X | |
| 6 593 | GW | GW50216AS | REAL | | GW | WP | 133 | X | X | | X | | X | |
| 6[illegible]693 | GW | GW50217AS | REAL | | GW | WP | 133 | X | X | | X | | X | |
| 62793 | GW | GW50147AS | REAL | | GW | WP | 115/196 | | | X | | | X | |
| 62793 | GW | GW50149AS | DUP | GW50147AS | GW | WP | 115/196 | | | X | | | X | |
| 62793 | GW | GW50152AS | TB | GW50147AS | GW | WP | 115/196 | | | X | | | | |
| 62793 | GW | GW50228AS | REAL | | GW | WP | 115/196 | | X | X | | | X | |
| 62793 | GW | GW50229AS | TB | GW50228AS | GW | WP | 115/196 | | | X | | | | |
| 62893 | GW | GW50122AS | REAL | | GW | WP | 115/196 | X | X | X | X | X | X | |
| 62893 | GW | GW50140AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 62893 | GW | GW50163AS | TB | GW50165AS | GW | WP | 115/196 | | | X | | | | |
| 62893 | GW | GW50165AS | REAL | | GW | WP | 115/196 | | | | | | X | |
| 62893 | GW | GW50180AS | REAL | | GW | WP | 115/196 | X | X | X | X | | X | |
| 62893 | GW | GW50200AS | TB | GW50180AS | GW | WP | 115/196 | | | X | | | | |

**Table 2-6 (Continued)**

| Location | TM15 Program | Sample Number | QC Code | QC Partner | Sample Type | Completion Type | IHSS | Analyses Requested | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Rads | Metals | VOA | SVOA | Pest\PCB | Water Qual | Geotech |
| 63093 | GW | GW50129AS | RNS | GW50135AS | GW | WELL | 133 | | | | | | X | |
| 63093 | GW | GW50135AS | REAL | | GW | WELL | 133 | X | X | X | X | X | X | |
| 63093 | GW | GW50168AS | TB | GW50135AS | GW | WELL | 133 | | | X | | | | |
| 63193 | GW | GW50128AS | REAL | | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 63193 | GW | GW50130AS | DUP | GW50128AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 63193 | GW | GW50132AS | RNS | GW50128AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 63193 | GW | GW50182AS | REAL | | GW | MINI | 115/196 | X | X | X | X | | X | |
| 63193 | GW | GW50183AS | DUP | GW50182AS | GW | MINI | 115/196 | X | X | X | X | | X | |
| 63193 | GW | GW50184AS | RNS | GW50182 183A | GW | MINI | 115/196 | X | X | X | X | | X | |
| 63193 | GW | GW50200AS | TB | GW50182 183A | GW | MINI | 115/196 | | | X | | | | |
| 63693 | GW | GW50137AS | REAL | | GW | WP | 133 | | | X | | | X | |
| 63693 | GW | GW50139AS | DUP | GW50137AS | GW | WP | 133 | | | X | | | X | |
| 63693 | GW | GW50166AS | REAL | | GW | WP | 133 | | | | | | X | |
| 63693 | GW | GW50167AS | TB | GW50166AS | GW | WP | 133 | | | X | | | | |
| 63693 | GW | GW50207AS | REAL | | GW | WP | 133 | | | | | | X | |
| 63793 | GW | GW50115AS | REAL | | GW | MINI | 133 | X | X | X | X | X | X | |
| 63793 | GW | GW50115AS | REAL | | GW | WP | 133 | X | X | X | X | X | X | |
| 63793 | GW | GW50116AS | RNS | GW50115AS | GW | WP | 133 | X | X | X | X | X | X | |
| 63793 | GW | GW50117AS | TB | GW50115AS | GW | WP | 133 | | | X | | | | |
| 63793 | GW | GW50206AS | REAL | | GW | WP | 133 | X | X | | X | | X | |
| 63893 | GW | GW50120AS | REAL | | GW | WP | 115 | X | X | X | X | X | X | |
| 63893 | GW | GW50121AS | REAL | | GW | WP | 115 | | X | X | X | X | X | |
| 63893 | GW | GW50187AS | REAL | | GW | WP | 115 | X | X | X | X | | X | |
| 63893 | GW | GW50196AS | TB | GW50187AS | GW | WP | 115 | | | X | | | | |
| 63993 | GW | GW50119AS | REAL | | GW | WP | 115 | X | X | X | X | X | X | |
| 63993 | GW | GW50188AS | REAL | | GW | WP | 115 | X | X | X | X | | X | |
| 63993 | GW | GW50197AS | TB | GW50188AS | GW | WP | 115 | | | X | | | | |
| 64093 | GW | GW50118AS | REAL | | GW | WP | 115 | X | X | X | X | X | X | |
| 64093 | GW | GW50189AS | REAL | | GW | WP | 115 | X | X | X | X | | X | |
| 64093 | GW | GW50198AS | TB | GW50189AS | GW | WP | 115 | | | X | | | | |
| 55194 | TDEM | BH00028AS | REAL | | BH | MINI | 133 | X | X | | | | | |
| 55194 | TDEM | BH00029AS | REAL | | BH | MINI | 133 | X | X | | | | | |
| 55194 | TDEM | BH00030AS | REAL | | BH | MINI | 133 | X | X | | | | | |
| 55194 | TDEM | BH00101AS | RNS | | BH | MINI | 133 | X | X | | | | | |
| 55294 | TDEM | BH00031AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55294 | TDEM | BH00032AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55294 | TDEM | BH00033AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55394 | GW | BH00055AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 55394 | GW | GW50106AS | REAL | | GW | MINI | 133 | X | X | X | X | X | X | |
| 55394 | GW | GW50107AS | RNS | | GW | MINI | 133 | X | X | X | X | X | X | |
| 55394 | GW | GW50111AS | TB | | GW | MINI | 133 | | | X | | | | |
| 55494 | TDEM | BH00023AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 55494 | TDEM | BH00024AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 55594 | TDEM | BH00025AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 55594 | TDEM | BH00100AS | RNS | | BH | MINI | 133 | X | X | | | | | |
| 55694 | TDEM | BH00041AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55694 | TDEM | BH00042AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55794 | GW | BH00057AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 55894 | TDEM | BH00036AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55894 | TDEM | BH00103AS | RNS | | BH | BH | 133 | X | X | | | | | |
| 55994 | TDEM | BH00034AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55994 | TDEM | BH00035AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 55994 | TDEM | BH00102AS | RNS | | BH | BH | 133 | X | X | | | | | |
| 56094 | TDEM | BH00037AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56094 | TDEM | BH00038AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56094 | TDEM | BH00039AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56094 | TDEM | BH00040AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56094 | TDEM | BH00104AS | RNS | | BH | BH | 133 | X | X | | | | | |

## Table 2-6 (Continued)

| Location | TM15 Program | Sample Number | QC Code | QC Partner | Sample Type | Completion Type | IHSS | Analyses Requested: Rads | Metals | VOA | SVOA | Pest/PCB | Water Qual | Geotech |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 56194 | TDEM | BH00043AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56194 | TDEM | BH00072AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56194 | TDEM | BH00073AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56194 | TDEM | BH00074AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56194 | TDEM | BH00075AS | REAL | BH00076AS | BH | BH | 133 | X | X | | | | | |
| 56194 | TDEM | BH00076AS | DUP | BH00075AS | BH | BH | 133 | X | X | | | | | |
| 56194 | TDEM | BH00077AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 56194 | TDEM | BH00105AS | RNS | | BH | BH | 133 | | | | | | | |
| 56194 | TDEM | BH00107AS | RNS | | BH | BH | 133 | X | X | | | | | |
| 56294 | GW | BH00026AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 56294 | GW | BH00027AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 56394 | GW | BH00056AS | REAL | | GEOTECH | BH | 133 | | | | | | | X |
| 56494 | GW | BH00021AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 56494 | GW | BH00022AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 56594 | GW | BH00058AS | REAL | | GEOTECH | MINI | 133 | | | | | | | X |
| 56594 | GW | GW50105AS | REAL | | GW | MINI | 133 | X | X | X | X | X | X | |
| 56594 | GW | GW50110AS | TB | | GW | MINI | 133 | | | X | | | | |
| 56694 | GW | BH00092AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 56694 | GW | BH00093AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 56694 | GW | BH00094AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 56694 | GW | BH00095AS | REAL | BH00096AS | BH | BH | 115/196 | X | X | | X | X | | |
| 56694 | GW | BH00096AS | DUP | BH00095AS | BH | BH | 115/196 | X | X | | X | X | | |
| 56694 | GW | BH00097AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 56694 | GW | BH00098AS | REAL | | BH | BH | 115/196 | X | X | | X | X | | |
| 56694 | GW | BH00099AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 56694 | GW | BH00109AS | RNS | | BH | BH | 115/196 | X | X | X | X | X | | |
| 56694 | GW | BH00110AS | RNS | | BH | BH | 115/196 | X | X | X | X | X | | |
| 56694 | GW | BH00111AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56694 | GW | BH00112AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56694 | GW | BH00113AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56694 | GW | BH00115AS | RNS | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56694 | GW | BH00116AS | FB | | BH | BH | 115/196 | | | X | | | | |
| 56694 | GW | BH00122AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56694 | GW | BH00134AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56794 | GEOTECH | BH00228AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56794 | GEOTECH | BH00229AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56794 | GEOTECH | BH00230AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56794 | GEOTECH | BH00231AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56794 | GEOTECH | BH00232AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56794 | GEOTECH | BH00233AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56794 | GEOTECH | BP00034AS | REAL | BP00035AS | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56794 | GEOTECH | BP00035AS | DUP | BP00034AS | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56794 | GEOTECH | BP00036AS | RNS | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56894 | GEOTECH | BH00216AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56894 | GEOTECH | BH00217AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56894 | GEOTECH | BH00218AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56894 | GEOTECH | BH00219AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56894 | GEOTECH | BH00220AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56894 | GEOTECH | BH00221AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56894 | GEOTECH | BH00222AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 56894 | GEOTECH | BH00244AS | TB | | BH | BH | 115/196 | | | X | | | | |
| 56894 | GEOTECH | BP00032AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56894 | GEOTECH | BP00033AS | RNS | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 56994 | GEOTECH | BH00185AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 56994 | GEOTECH | BH00186AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 56994 | GEOTECH | BH00187AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 56994 | GEOTECH | BH00188AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 56994 | GEOTECH | BH00189AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |

**Table 2-6 (Continued)**

| Location | TM15 Program | Sample Number | QC Code | QC Partner | Sample Type | Completion Type | IHSS | Analyses Requested | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Rads | Metals | VOA | SVOA | Pest/PCB | Water Qual | Geotech |
| 56994 | GEOTECH | BH00190AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 56994 | GEOTECH | BH00191AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 56994 | GEOTECH | BP00013AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57094 | GEOTECH | BH00138AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00139AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00140AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00141AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00142AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00143AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00144AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00145AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00146AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57094 | GEOTECH | BH00147AS | REAL | BH00148AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57094 | GEOTECH | BH00148AS | DUP | BH00147AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57194 | GEOTECH | BH00192AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57194 | GEOTECH | BH00193AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57194 | GEOTECH | BH00194AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57194 | GEOTECH | BH00195AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57194 | GEOTECH | BH00196AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 57194 | GEOTECH | BP00014AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57194 | GEOTECH | BP00015AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57194 | GEOTECH | BP00016AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57194 | GEOTECH | BP00017AS | RNS | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57194 | GEOTECH | BP00018AS | RNS | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57194 | GEOTECH | BP00029AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57294 | TREAT | BH00090AS | REAL | | BH | BH | 133 | | | | | | | |
| 57294 | TREAT | BH00091AS | REAL | | DRUM | BH | 133 | X | X | | | | | |
| 57394 | GEOTECH | BH00123AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57394 | GEOTECH | BH00124AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57394 | GEOTECH | BH00125AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57494 | GEOTECH | BH00175AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57494 | GEOTECH | BH00176AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57494 | GEOTECH | BH00177AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57494 | GEOTECH | BP00004AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 57594 | GW | BH00078AS | REAL | | BH | WELL | 115/196 | X | X | X | X | X | | |
| 57594 | GW | BH00079AS | REAL | | BH | WELL | 115/196 | X | X | | X | X | | |
| 57594 | GW | BH00080AS | REAL | | BH | WELL | 115/196 | | | X | | | | |
| 57594 | GW | BH00081AS | REAL | | BH | WELL | 115/196 | | | X | | | | |
| 57594 | GW | BH00082AS | REAL | | BH | WELL | 115/196 | X | X | | X | X | | |
| 57594 | GW | BH00083AS | REAL | | BH | WELL | 115/196 | | | X | | | | |
| 57594 | GW | BH00084AS | REAL | | BH | WELL | 115/196 | | | X | | | | |
| 57594 | GW | BH00085AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57594 | GW | BH00086AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57594 | GW | BH00087AS | REAL | | BH | WELL | 115/196 | X | X | X | X | X | | |
| 57594 | GW | BH00108AS | RNS | | BH | WELL | 115/196 | X | X | | | | | |
| 57594 | GW | BH00117AS | RNS | | DRUM | WELL | 115/196 | X | X | X | | | | |
| 57594 | GW | BH00121AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 57694 | GEOTECH | BH00197AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57694 | GEOTECH | BH00198AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57694 | GEOTECH | BH00199AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57694 | GEOTECH | BH00200AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57694 | GEOTECH | BH00201AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57694 | GEOTECH | BP00019AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 57694 | GEOTECH | BP00022AS | RNS | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 57794 | GEOTECH | BH00128AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57794 | GEOTECH | BH00129AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57794 | GEOTECH | BH00130AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 57794 | GEOTECH | BH00131AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |

## Table 2-6 (Continued)

| Location | TM15 Program | Sample Number | QC Code | QC Partner | Sample Type | Completion Type | IHSS | Analyses Requested | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Rads | Metals | VOA | SVOA | Pest/PCB | Water Qual | Geotech |
| 57894 | GW | GW50141AS | DUP | GW50161AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 57894 | GW | GW50142AS | RNS | | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 57894 | GW | GW50145AS | TB | | GW | MINI | 115/196 | | | X | | | | |
| 57894 | GW | GW50161AS | REAL | GW50141AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 57894 | GW | GW50162AS | TB | | GW | MINI | 115/196 | | | | | | | |
| 57994 | GW | BH00044AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 57994 | GW | BH00045AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 57994 | GW | BH00046AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 57994 | GW | BH00047AS | REAL | | BH | MINI | 115/196 | X | X | | X | X | | |
| 58094 | GW | BH00061AS | REAL | | GEOTECH | MINI | 115/196 | | | | | | | X |
| 58094 | GW | GW50101AS | RNS | | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 58094 | GW | GW50102AS | REAL | GW50103AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 58094 | GW | GW50103AS | DUP | GW50102AS | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 58094 | GW | GW50108AS | TB | | GW | MINI | 115/196 | | | X | | | | |
| 58194 | GW | BH00062AS | REAL | | GEOTECH | MINI | 115/196 | | | | | | | X |
| 58294 | GW | BH00048AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58294 | GW | BH00049AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58294 | GW | BH00050AS | REAL | | BH | MINI | 115/196 | X | X | | X | X | | |
| 58394 | GEOTECH | BH00223AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 58394 | GEOTECH | BH00224AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 58394 | GEOTECH | BH00225AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 58394 | GEOTECH | BH00226AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 58394 | GEOTECH | BH00227AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 58394 | GEOTECH | BP00046AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 58494 | GW | BH00065AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58494 | GW | BH00066AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58494 | GW | BH00067AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58494 | GW | BH00068AS | REAL | | BH | MINI | 115/196 | X | X | | X | X | | |
| 58494 | GW | BH00069AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58494 | GW | BH00070AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58494 | GW | BH00071AS | REAL | | BH | MINI | 115/196 | X | X | | X | X | | |
| 58594 | GW | BH00063AS | REAL | | GEOTECH | MINI | 115/196 | | | | | | | X |
| 58594 | GW | GW50104AS | REAL | | GW | MINI | 115/196 | X | X | X | X | X | X | |
| 58594 | GW | GW50109AS | TB | | GW | MINI | 115/196 | | | X | | | | |
| 58694 | GW | BH00051AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58694 | GW | BH00052AS | REAL | | BH | MINI | 115/196 | X | X | | X | X | | |
| 58794 | GW | BH00053AS | REAL | | BH | MINI | 115/196 | | | X | | | | |
| 58794 | GW | BH00054AS | REAL | | BH | MINI | 115/196 | X | X | | X | X | | |
| 58794 | GW | BH00106AS | RNS | | BH | MINI | 115/196 | X | X | X | X | X | | |
| 58894 | TDEM | BH00064AS | REAL | | BH | BH | 133 | X | X | | X | X | | |
| 58994 | GEOTECH | BH00126AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 58994 | GEOTECH | BH00127AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 59094 | GEOTECH | BH00202AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 59094 | GEOTECH | BH00203AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 59094 | GEOTECH | BP00023AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 59094 | GEOTECH | BP00024AS | RNS | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 59094 | GEOTECH | BP00030AS | TB | | DRUM | BH | 115/196 | | | X | | | | |
| 59194 | GEOTECH | BH00238AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59194 | GEOTECH | BH00239AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59194 | GEOTECH | BH00240AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59194 | GEOTECH | BH00241AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59194 | GEOTECH | BH00242AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59194 | GEOTECH | BP00039AS | REAL | BP00040AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59194 | GEOTECH | BP00040AS | DUP | BP00039AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59194 | GEOTECH | BP00041AS | RNS | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59194 | GEOTECH | BP00052AS | TB | | DRUM | WELL | 115/196 | | | | | | | |
| 59[illegible]94 | GEOTECH | BH00170AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59[illegible]94 | GEOTECH | BH00171AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |

## Table 2-6 (Continued)

| Location | TM15 Program | Sample Number | QC Code | QC Partner | Sample Type | Completion Type | IHSS | Analyses Requested | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Rads | Metals | VOA | SVOA | Pest/PCB | Water Qual | Geotech |
| 59 94 | GEOTECH | BH00172AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59294 | GEOTECH | BH00173AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59294 | GEOTECH | BP00003AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59494 | GW | BH00149AS | RNS | | BH | BH | 115/196 | X | X | X | X | X | | |
| 59494 | GW | BH00150AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 59494 | GW | BH00151AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 59494 | GW | BH00152AS | REAL | | BH | BH | 115/196 | X | X | | X | X | | |
| 59494 | GW | BH00153AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 59494 | GW | BH00154AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 59494 | GW | BH00155AS | REAL | | BH | BH | 115/196 | X | X | | X | X | | |
| 59494 | GW | BH00156AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 59494 | GW | BH00157AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 59494 | GW | BH00158AS | REAL | | BH | BH | 115/196 | | | X | | | | |
| 59494 | GW | BH00159AS | REAL | BH00160AS | BH | BH | 115/196 | X | X | | X | X | | |
| 59494 | GW | BH00160AS | DUP | BH00159AS | BH | BH | 115/196 | X | X | | X | X | | |
| 59494 | GW | BH00165AS | TB | | BH | BH | 115/196 | | | X | | | | |
| 59594 | GEOTECH | BH00132AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59594 | GEOTECH | BH00133AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59594 | GEOTECH | BH00135AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59594 | GEOTECH | BH00136AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59594 | GEOTECH | BH00137AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59594 | GEOTECH | BP00001AS | REAL | | DRUM | WELL | 115/196 | | | X | | | | |
| 59594 | GEOTECH | BP00002AS | REAL | | DRUM | WELL | 115/196 | | | X | | | | |
| 59594 | GEOTECH | BP00006AS | REAL | | DRUM | WELL | 115/196 | | X | | | | | |
| 59594 | GEOTECH | BP00037AS | REAL | | DRUM | WELL | 115/196 | | X | | | | | |
| 59594 | GEOTECH | BP00038AS | RNS | | DRUM | WELL | 115/196 | | X | | | | | |
| 59694 | GEOTECH | BH00211AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59694 | GEOTECH | BH00212AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59694 | GEOTECH | BH00213AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59694 | GEOTECH | BH00214AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59694 | GEOTECH | BH00215AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59694 | GEOTECH | BP00028AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59694 | GEOTECH | BP00031AS | RNS | | DRUM | WELL | 115/196 | X | X | | | | | |
| 59794 | GEOTECH | BH00178AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59794 | GEOTECH | BH00179AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59794 | GEOTECH | BH00180AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 59794 | GEOTECH | BP00005AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59894 | GW | BH00161AS | REAL | | BH | WELL | 115/196 | | | X | | | | |
| 59894 | GW | BH00162AS | REAL | | BH | WELL | 115/196 | X | X | | X | X | | |
| 59894 | GW | BH00163AS | RNS | | BH | WELL | 115/196 | X | X | X | X | X | | |
| 59894 | GW | BH00164AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59894 | GW | BH00166AS | TB | | BH | WELL | 115/196 | | | X | | | | |
| 59894 | GW | BP00007AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 59894 | GW | BP00010AS | FB | | DRUM | WELL | 115/196 | | | X | | | | |
| 59894 | GW | BP00011AS | REAL | | DRUM | WELL | 115/196 | X | X | X | | | | |
| 59894 | GW | BP00012AS | REAL | | DRUM | WELL | 115/196 | X | X | X | | | | |
| 59894 | GW | BP00020AS | TB | | DRUM | WELL | 115/196 | | | X | | | | |
| 59994 | TDEM | BH00088AS | REAL | | BH | BH | 133 | X | X | X | X | X | | |
| 60094 | TDEM | BH00089AS | REAL | | BH | BH | 133 | X | X | | | | | |
| 71194 | GEOTECH | BH00182AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 71194 | GEOTECH | BH00183AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 71194 | GEOTECH | BH00184AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 71194 | GEOTECH | BP00008AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71194 | GEOTECH | BP00009AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71194 | GEOTECH | BP00021AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71194 | GEOTECH | BP00025AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71294 | GEOTECH | BH00204AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 71 94 | GEOTECH | BH00205AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |

**Table 2-6 (Continued)**

| Location | TM15 Program | Sample Number | QC Code | QC Partner | Sample Type | Completion Type | IHSS | Analyses Requested: Rads | Metals | VOA | SVOA | Pest/PCB | Water Qual | Geotech |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 71 94 | GEOTECH | BH00206AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 71294 | GEOTECH | BH00207AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 71294 | GEOTECH | BH00208AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 71294 | GEOTECH | BH00209AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 71294 | GEOTECH | BH00210AS | REAL | | GEOTECH | BH | 115/196 | | | | | | | X |
| 71294 | GEOTECH | BP00026AS | REAL | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 71294 | GEOTECH | BP00027AS | RNS | | DRUM | BH | 115/196 | X | X | X | X | X | | |
| 71394 | GW | BH00245AS | REAL | | GEOTECH | BH | 133 | | | | | | | X |
| 71494 | GEOTECH | BH00243AS | REAL | | GEOTECH | WELL | 115/196 | | | | | | | X |
| 71494 | GEOTECH | BP00042AS | REAL | BP00043AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00043AS | DUP | BP00042AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00044AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00045AS | REAL | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00047AS | RNS | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00048AS | REAL | BP00049AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00049AS | DUP | BP00048AS | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00050AS | RNS | | DRUM | WELL | 115/196 | X | X | X | X | X | | |
| 71494 | GEOTECH | BP00051AS | TB | | DRUM | WELL | 115/196 | | | X | | | | |
| SS133194 | SS | SS00001AS | REAL | | SS | SS | 115/196 | X | | | | | | |
| SS133294 | SS | SS00002AS | REAL | | SS | SS | 115/196 | X | | | | | | |
| SS133394 | SS | SS00003AS | REAL | | SS | SS | 115/196 | X | | | | | | |
| SS133494 | SS | SS00004AS | REAL | | SS | SS | 115/196 | X | | | | | | |
| SS133594 | SS | SS00005AS | REAL | | SS | SS | 115/196 | X | | | | | | |
| SS133694 | SS | SS00006AS | REAL | | SS | SS | 115/196 | X | | | | | | |
| SS133794 | SS | SS00007AS | REAL | | SS | SS | 115/196 | X | | | | | | |
| SS133894 | SS | SS00008AS | REAL | SS00009AS | SS | SS | 115/196 | X | | | | | | |
| SS133894 | SS | SS00009AS | DUP | SS00008AS | SS | SS | 115/196 | X | | | | | | |
| SS133894 | SS | SS00010AS | RNS | | SS | SS | 115/196 | X | | | | | | |

## Table 2 7

## Summary Statistics for Total Metals from Groundwater Samples

| Constituent (COCs are ***Bold/Italic***) | OU 5 or Background Data | Number of Samples | Range of Reporting Limits (ug/l) | Percent Detection | Range of Non-detected Concentrations (ug/l) | Range of Detected Concentrations (ug/l) | Mean** Concentration (ug/l) | Standard Deviation** |
|---|---|---|---|---|---|---|---|---|
| | | | | **Total Concentrations** | | | | |
| ***Aluminum*** | Background | 149 | 18 -- 200 | 91 28 | 22 6 200 | 26 8 -- 63 900 | 3 495 55 | 7 758 70 |
| | IHSS 115 | 11 | 11 -- 200 | 100 | N/A | 129 75 -- 42 800 | 12 623 35 | 17 019 88 |
| | IHSS 133 | 4 | 11 -- 26 | 100 | N/A | 47 -- 103 000 | 45 786 75 | 42733 07 |
| | Pre-TM15 | 17 | 18 -- 200 | 88 24 | 200 | 1,100 -- 357,000 | 66 186 18 | 99 719 80 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **45,224 03** | **-32%** |
| Antimony | Background | 141 | 17 -- 60 | 16 31 | 7 -- 70 | 7 1 -- 86 6 | 16 37 | 11 19 |
| | IHSS 115 | 13 | 2 -- 60 | 15 | 1 -- 30 | 13 5 -- 13 7 | 20 22 | 11 71 |
| | IHSS 133 | 4 | 2 13 | 0 | 1 -- 6 5 | N/A | 4 90 | 2 63 |
| | Pre-TM15 | 16 | 17 60 | 12 5 | 27 60 | 39 2 -- 40 8 | 25 44 | 8 69 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **20 89** | **18%** |
| Arsenic | Background | 138 | 0 7 -- 10 000 | 11 59 | 0 7 10 | 0 8 -- 3 0 | 1 83 | 1 76 |
| | IHSS 115 | 13 | 1 10 | 38 | 1 5 -- 27 3 | 2 3 -- 12 | 8 32 | 7 25 |
| | IHSS 133 | 3 | 1 3 | 33 | 0 7 -- 4 7 | 2 8 | 2 67 | 2 |
| | Pre-TM15 | 17 | 2 -- 10 | 64 71 | 3 10 | 1 1 -- 13 3 | 5 60 | 2 98 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **6 41** | **14%** |
| ***Barium*** | Background | 149 | 2 1 200 | 81 21 | 100 -- 200 | 25 9 -- 752 | 106 13 | 69 40 |
| | IHSS 115 | 13 | 0 4 -- 200 | 100 | N/A | 37 1 -- 645 | 322 93 | 220 95 |
| | IHSS 133 | 4 | 0 4 -- 12 | 100 | N/A | 137 -- 619 | 364 50 | 197 6 |
| | Pre-TM15 | 17 | 16 -- 200 | 100 | N/A | 23 7 -- 3,040 | 873 95 | 872 28 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **603.33** | **-31%** |
| ***Beryllium*** | Background | 148 | 0 6 -- 5 | 7 43 | 0 8 -- 5 | 0 7 -- 4 8 | 1 05 | 0 87 |
| | IHSS 115 | 13 | 0 2 -- 5 | 46 | 0 5 -- 2 5 | 0 21 -- 2 6 | 2 01 | 0 79 |
| | IHSS 133 | 3 | 0 2 -- 1 | 100 | N/A | 2 2 -- 6 7 | 4 07 | 2 35 |
| | Pre-TM15 | 17 | 1 -- 5 | 64 71 | 1 -- 5 | 1 55 -- 29 4 | 6 38 | 8 01 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **4 45** | **30%** |
| Cadmium | Background | 148 | 2 3 -- 5 | 11 49 | 1 -- 11 1 | 1 1 -- 7 8 | 1 52 | 1 07 |
| | IHSS 115 | 13 | 1 6 -- 5 | 15 | 0 8 -- 2 5 | 2 1 -- 4 9 | 2 33 | 0 94 |
| | IHSS 133 | 4 | 1 6 -- 3 | 0 | 0 8 -- 1 5 | N/A | 1 20 | 0 36 |
| | Pre-TM15 | 17 | 2 -- 5 | 17 65 | 2 5 | 4 2 -- 8 2 | 2 71 | 1 98 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **2.39** | **12%** |
| Calcium | Background | 149 | 17 4 -- 5 000 | 100 | N/A | 15 950 -- 186 000 | 55 030 23 | 31 667 78 |
| | IHSS 115 | 13 | 3 4 -- 5 000 | 100 | N/A | 43 800 -- 237 500 | 100 915 38 | 56 451 10 |
| | IHSS 133 | 4 | 3 4 -- 20 | 100 | N/A | 48 100 -- 61 500 | 53 825 00 | 6148 92 |
| | Pre-TM15 | 17 | 149 -- 5,000 | 100 | N/A | 53,200 -- 413,000 | 117,244 10 | 84 416 57 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **103,539 70** | **12%** |
| Cesium | Background | 142 | 500 -- 1 000 | 10 56 | 2 -- 1 000 | 30 -- 90 | 151 81 | 200 34 |
| | IHSS 115 | 13 | 20 -- 1 000 | 0 | 10 -- 500 | N/A | 287 29 | 239 61 |
| | IHSS 133 | 4 | 22 -- 79 | 0 | 21 5 -- 39 5 | N/A | 31 83 | 7 54 |
| | Pre-TM15 | 17 | 13 -- 1,000 | 17 65 | 32 -- 1 000 | 13 -- 40 | 285 71 | 215 93 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **256 45** | **10%** |
| Chromium | Background | 145 | 2 -- 10 | 41 38 | 2 14 9 | 2 1 -- 729 | 12 30 | 60 77 |
| | IHSS 115 | 13 | 1 8 -- 10 | 31 | 0 9 -- 35 5 | 28 -- 52 1 | 18 82 | 17 25 |
| | IHSS 133 | 4 | 1 8 -- 3 | 75 | 1 5 | 38 6 -- 110 | 47 63 | 45 28 |
| | Pre-TM15 | 17 | 3 -- 10 | 70 59 | 5 10 | 9 3 -- 442 | 84 34 | 128 03 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **54 97** | **35%** |
| Cobalt | Background | 148 | 2 7 -- 50 | 13 51 | 2 50 | 3 2 -- 39 4 | 7 56 | 9 69 |
| | IHSS 115 | 12 | 1 4 -- 50 | 58 | 4 -- 25 | 5 4 -- 24 5 | 18 63 | 7 56 |
| | IHSS 133 | 4 | 1 4 -- 7 | 75 | 3 5 | 15 4 -- 34 8 | 17 67 | 12 91 |
| | Pre-TM15 | 17 | 4 -- 50 | 70 59 | 6 50 | 5 6 -- 161 | 42 13 | 41 17 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **30 62** | **27%** |

**Table 2 7 (Continued)**

| Constituent (COCs are ***Bold/Italic***) | OU 5 or Background Data | Number of Samples | Range of Reporting Limits (ug/l) | Percent Detection | Range of Non-detected Concentrations (ug/l) | Range of Detected Concentrations (ug/l) | Mean** Concentration (ug/l) | Standard Deviation** |
|---|---|---|---|---|---|---|---|---|
| Copper | Background | 148 | 2 25 | 54 05 | 2 77 5 | 1 105 | 9 43 | 11 12 |
| | IHSS 115 | 13 | 1 1 25 | 46 | 7 2 44 6 | 2 5 -- 124 | 41 20 | 40 53 |
| | IHSS 133 | 4 | 1 1 3 | 75 | 5 4 | 26 3 -- 75 | 34 43 | 29 25 |
| | Pre-TM15 | 17 | 2 25 | 82 35 | 25 | 11 15 420 | 101 11 | 128 86 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 70 36 | 30% |
| Iron | Background | 149 | 4 7 100 | 93 29 | 11 8 -- 449 | 6 5 -- 97 000 | 3 906 27 | 9 681 12 |
| | IHSS 115 | 13 | 2 100 | 100 | N/A | 276 8 -- 71 800 | 25 207 33 | 27 234 94 |
| | IHSS 133 | 4 | 2 -- 7 3 | 75 | 141 | 36 200 -- 110 000 | 47 435 25 | 45802 5 |
| | Pre-TM15 | 17 | 5 -- 100 | 88 24 | 100 | 3,190 -- 418,000 | 90,870 00 | 114 363 70 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 60,653 71 | 33% |
| Lead | Background | 141 | 0 8 -- 3 000 | 63 12 | 1 5 | 1 -- 52 50 | 3 57 | 5 53 |
| | IHSS 115 | 13 | 0 9 -- 3 | 62 | 1 5 | 1 3 -- 74 7 | 24 04 | 27 88 |
| | IHSS 133 | 4 | 0 9 -- 2 | 50 | 0 45 -- 1 | 13 5 -- 34 1 | 12 26 | 15 76 |
| | P e-TM15 | 17 | 1 -- 5 | 88 24 | 5 | 1 2 -- 240 | 54 72 | 69 08 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 37 99 | 31% |
| Lithium | Background | 149 | 2 100 | 77 18 | 3 15 -- 100 | 1 1 -- 266 | 33 25 | 48 46 |
| | IHSS 115 | 12 | 1 100 | 58 | 5 5 -- 50 | 15 2 -- 181 5 | 55 22 | 48 71 |
| | IHSS 133 | 4 | 1 -- 14 | 100 | N/A | 23 7 -- 75 8 | 42 23 | 23 15 |
| | Pre-TM15 | 17 | 2 100 | 82 35 | 17 -- 30 | 5 -- 306 | 73 72 | 96 52 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 63 18 | 14% |
| Magnesium | Background | 149 | 29 6 -- 5 000 | 97 99 | 5 000 | 2 465 -- 47 900 | 10 330 61 | 7 943 20 |
| | IHSS 115 | 13 | 12 -- 5 000 | 100 | N/A | 9 505 -- 68 800 | 23 708 08 | 15 766 02 |
| | IHSS 133 | 4 | 12 -- 37 | 100 | N/A | 14 500 -- 26 800 | 18 675 00 | 5517 47 |
| | Pre-TM15 | 17 | 45 -- 5,000 | 100 | N/A | 14,200 -- 113,000 | 34,694 12 | 27,169 76 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 28,608 97 | 18% |
| ***Manganese*** | Background | 149 | 1 -- 15 | 90 6 | 1 15 | 1 8 -- 1 950 | 92 17 | 187 34 |
| | IHSS 115 | 13 | 0 5 -- 15 | 100 | N/A | 18 45 -- 3 290 | 1 325 64 | 1 224 08 |
| | IHSS 133 | 4 | 0 5 -- 1 | 75 | 5 7 | 417 -- 1 120 | 604 18 | 493 99 |
| | Pre-TM15 | 17 | 1 -- 15 | 100 | N/A | 14 -- 13,700 | 2,847 89 | 3 232 99 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 2,001 89 | 30% |
| Mercury | Background | 148 | 0 2 | 2 03 | 0 2 -- 0 22 | 0 21 -- 0 27 | 0 10 | 0 02 |
| | IHSS 115 | 13 | 0 2 | 23 | 0 1 | 0 2 -- 0 82 | 0 17 | 0 20 |
| | IHSS 133 | 4 | 0 2 | 0 | 0 1 | N/A | 0 10 | 0 |
| | Pre-TM15 | 17 | 0 2 | 29 41 | 0 2 | 0 24 -- 3 | 0 42 | 0 74 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 0 29 | 32% |
| Molybdenum | Background | 150 | 3 5 -- 200 | 28 | 2 200 | 2 2 -- 80 5 | 23 84 | 39 57 |
| | IHSS 115 | 13 | 2 5 -- 200 | 8 | 6 -- 100 | 5.2 | 56 98 | 48 37 |
| | IHSS 133 | 3 | 2 5 -- 3 | 33 | 5 -- 8 8 | 3 5 | 5 77 | 2 73 |
| | Pre-TM15 | 17 | 7 -- 200 | 17 65 | 11 -- 200 | 11 1 -- 18 | 46 35 | 46 38 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 46 85 | 1% |
| Nickel | Background | 146 | 11 -- 40 | 28 08 | 2 -- 40 | 2 1 -- 334 | 12 49 | 28 44 |
| | IHSS 115 | 13 | 3 7 -- 40 | 54 | 1 85 -- 20 | 20 5 41 | 23 75 | 11 17 |
| | IHSS 133 | 4 | 3 7 -- 12 | 75 | 6 | 25 7 -- 75 5 | 34 06 | 29 44 |
| | Pre-TM15 | 17 | 10 -- 40 | 82 35 | 11 -- 40 | 13 6 -- 313 0 | 82 17 | 92 59 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 54 17 | 34% |
| Potass um | Background | 150 | 675 -- 5 000 | 76 67 | 289 -- 5 000 | 243 -- 8 370 | 1 730 24 | 1 177 83 |
| | IHSS 115 | 13 | 360 -- 5 000 | 62 | 2 500 | 1 190 -- 11 500 | 4 912 31 | 3 679 45 |
| | IHSS 133 | 4 | 360 -- 680 | 100 | N/A | 1 450 -- 13 700 | 6 800 00 | 5086 98 |
| | Pre-TM15 | 17 | 640 -- 5,000 | 82 35 | 5 000 | 3 670 -- 49,700 | 11 681 76 | 13 052 86 |
| | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | 8,519 12 | 27% |
| Selenium | Background | 145 | 1 4 -- 5 | 23 45 | 1 5 | 1 05 -- 456 | 7 64 | 41 84 |
| | IHSS 115 | 13 | 2 5 | 8 | 1 6 8 | 8 3 | 3 25 | 2 27 |
| | IHSS 133 | 4 | 2 -- 3 | 0 | 1 4 3 | N/A | 1 90 | 1 61 |
| | Pre-TM15 | 16 | 2 -- 5 | 25 | 2 5 | 4 7 -- 126 | 10 63 | 30 87 |
| | | Mean of OU 5 Data and Perce t Cha ge from Pre-TM15 Mean -- | | | | | 6 66 | 37% |

**Table 2 7 (Continued)**

| Constituent (COCs are ***Bold/Italic***) | OU 5 or Background Data | Number of Samples | Range of Reporting Limits (ug/l) | Percent Detection | Range of Non-detected Concentrations (ug/l) | Range of Detected Concentrations (ug/l) | Mean** Concentration (ug/l) | Standard Deviation** |
|---|---|---|---|---|---|---|---|---|
| Silicon | Background | 84 | 1 4 1 000 | 100 | N/A | 1 31 -- 116 000 | 16 575 34 | 15 401 00 |
| | IHSS 115 | 13 | 9 100 | 100 | N/A | 4 770 -- 87 500 | 32 034 23 | 28 048 25 |
| | IHSS 133 | 4 | 9 120 | 100 | N/A | 8 050 -- 140 000 | 80 287 50 | 54614 05 |
| | Pre-TM15 | 17 | 13 100 | 100 | N/A | 7 130 -- 354 000 | 79,041 47 | 87 784 49 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **61,214 71** | **23%** |
| Silver | Background | 147 | 2 1 -- 10 | 6 8 | 2 -- 10 | 2 1 -- 4 8 | 2 15 | 1 62 |
| | IHSS 115 | 12 | 2 10 | 17 | 1 5 | 8 2 -- 11 2 | 4 70 | 2 87 |
| | IHSS 133 | 4 | 2 4 | 0 | 1 2 | N/A | 1 25 | 0 5 |
| | Pre-TM15 | 17 | 3 10 | 23 53 | 3 -- 10 | 3 8 -- 53 2 | 7 35 | 12 27 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **5 65** | **23%** |
| Sodium | Background | 149 | 28 3 5 000 | 98 66 | 5 000 | 4 300 -- 194 000 | 30 081 85 | 40 019 71 |
| | IHSS 115 | 13 | 10 5 000 | 100 | N/A | 9 760 -- 184 000 | 42 593 08 | 50 373 11 |
| | IHSS 133 | 4 | 10 23 | 100 | N/A | 34 900 -- 47 100 | 39 725 00 | 5251 27 |
| | Pre-TM15 | 17 | 55 5 000 | 100 | N/A | 13,600 -- 120 000 | 38 650 00 | 25 878 96 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **40,284 12** | **4%** |
| Strontium | Background | 146 | 0 8 200 | 89 73 | 200 | 58 1 -- 1 770 | 313 02 | 270 75 |
| | IHSS 115 | 12 | 0 2 200 | 100 | N/A | 232 -- 1 485 | 585 17 | 370 58 |
| | IHSS 133 | 4 | 0 2 -- 1 | 100 | N/A | 367 -- 478 | 420 75 | 54 05 |
| | Pre-TM15 | 17 | 1 200 | 100 | N/A | 344 -- 2 575 | 789 97 | 521 38 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **670 74** | **15%** |
| Thallium | Background | 146 | 0 1 -- 10 | 8 22 | 0 9 -- 10 | 1 -- 1 3 | 1 58 | 1 79 |
| | IHSS 115 | 13 | 1 -- 100 | 8 | 0 5 -- 27 5 | 3 8 | 5 59 | 6 80 |
| | IHSS 133 | 4 | 1 4 2 | 0 | 0 5 -- 2 1 | N/A | 1 28 | 0 68 |
| | Pre-TM15 | 17 | 2 -- 10 | 5 88 | 3 10 | 1 3 | 3 05 | 1 70 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **3 81** | **25%** |
| Tin | Background | 149 | 5 -- 200 | 8 05 | 9 4 200 | 14 5 -- 53 1 | 30 68 | 36 52 |
| | IHSS 115 | 12 | 8 9 -- 200 | 8 | 4 45 100 | 40 3 | 66 10 | 42 96 |
| | IHSS 133 | 4 | 8 9 -- 24 | 75 | 4 45 | 15 -- 29 7 | 18 34 | 11 07 |
| | Pre-TM15 | 17 | 18 -- 200 | 35 29 | 28 -- 200 | 36 4 -- 300 | 88 91 | 64 34 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **72.06** | **19%** |
| ***Vanadium*** | Background | 149 | 3 -- 50 | 71 14 | 2 -- 50 | 2 2 -- 167 | 14 46 | 18 72 |
| | IHSS 115 | 13 | 1 5 -- 50 | 62 | 25 | 3 6 -- 93 9 | 43 58 | 29 95 |
| | IHSS 133 | 4 | 1 5 -- 3 | 75 | 1 5 | 60 4 -- 183 | 80 48 | 75 64 |
| | Pre-TM15 | 17 | 3 -- 50 | 76 47 | 4 50 | 19 85 -- 674 | 150 03 | 201 57 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **101 15** | **-33%** |
| Zinc | Background | 149 | 1 7 -- 20 | 77 18 | 4 2 -- 36 6 | 5 9 -- 498 | 35 85 | 50 33 |
| | IHSS 115 | 12 | 1 -- 20 | 92 | 19 8 | 12 75 -- 261 | 81 83 | 84 93 |
| | IHSS 133 | 4 | 1 -- 2 | 75 | 18 1 | 75 4 -- 180 | 87 43 | 67 45 |
| | Pre-TM15 | 17 | 3 -- 20 | 82 35 | 20 | 37 8 -- 982 | 248 77 | 288 25 |
| | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **168 51** | **32%** |

Notes OU 5 data where

IHSS 115 refers to groundwater samples obtained at IHSS 115 for the groundwater monitoring program as detailed in TM15

IHSS 133 refers to groundwater samples obtained at IHSS 133 for the groundwater monitoring program as detailed in TM15

Pre-TM15 refers to samples collected within OU 5 prior to January 1994

Mean and Standard Deviation are calculated assuming data are normally distributed

ug/l micrograms per liter N/A = not applicable

## Table 2-8

## Summary Statistics for Dissolved Data from Groundwater Samples

| C nstit ent<br><br>(COCs are<br>*B ld/Itali* ) | CU 5 or Background Data | Number of Samples | Range of Reporting Limits (ug/l) | Percent Detection | R nge of N -detected Concentrations (ug/l) | Range of Detected Concentrations (ug/l) | Mean Concentration (ug/l) | St ndard Deviat on |
|---|---|---|---|---|---|---|---|---|
| **Dissolved Concentrations** | | | | | | | | |
| ***Alumi m*** | Background | 248 | 10 200 | 68 15 | 5 200 | 5 1 8 610 | 105 38 | 595 50 |
| | IHSS 115 | 25 | 8 6 200 | 24 | 4 3 291 5 | 26 4 900 | 437 86 | 1 231 98 |
| | IHSS 133 | 9 | 8 6 200 | 0 | 4 3 100 | N/A | 57 79 | 50 06 |
| | Pre-TM15 | 14 | 18 200 | 21 43 | 24 200 | 24 2 37 7 | 43 24 | 37 78 |
| | | | | | | Mean of CU 5 Data and Percent Change from Pre-TM15 Mean | **251 50** | **482%** |
| Antimony | Background | 248 | 0 05 60 | 28.23 | 6 60 | 7 8 54 1 | 15 00 | 9 95 |
| | IHSS 115 | 25 | 2 60 | 12 | 5 5 30 | 3 8 71 9 | 27 48 | 13 11 |
| | IHSS 133 | 9 | 11 60 | 0 | 5 5 30 | N/A | 19 33 | 12 65 |
| | Pre-TM15 | 14 | 17 60 | 7 4 | 27 60 | 39 4 | 23 17 | 8 06 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | **24 69** | **7%** |
| Arsenic | Background | 220 | 0 8 10 | 5 | 0 8 10 | 1 15 | 1 61 | 1 84 |
| | IHSS 115 | 27 | 1 10 | 25 9 | 0 7 5 | 1 3 9 3 | 3 99 | 1 96 |
| | IHSS 133 | 8 | 1 10 | 13 | 0 7 5 | 1 | 2 93 | 2 22 |
| | Pre-TM15 | 14 | 2 10 | 42 86 | 2 10 | 2 8 8 05 | 3 98 | 2 55 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | **3 81** | **-4%** |
| ***Barium*** | Background | 256 | 0 02 200 | 84 38 | 40 200 | 23 6 203 | 83 30 | 33 43 |
| | IHSS 115 | 25 | 0 6 200 | 100 | N/A | 16 75 -- 457 | 198 49 | 121 26 |
| | IHSS 133 | 8 | 0 6 200 | 100 | N/A | 61 5 -- 145 | 113 80 | 31 37 |
| | Pre-TM15 | 14 | 16 200 | 100 | N/A | 108 647 | 242 18 | 150 33 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | **196 03** | **19%** |
| ***Beryllium*** | Background | 212 | 0.2 5 | 2 36 | 0 3 5 | 0 8 -- 4 | 0 95 | 0 82 |
| | IHSS 115 | 26 | 0 2 -- 5 | 7 7 | 0 1 2 5 | 0 49 -- 0 56 | 1 79 | 0 99 |
| | IHSS 133 | 8 | 0.2 5 | 0 | 0 1 2 5 | N/A | 1 40 | 1 19 |
| | Pre-TM15 | 14 | 1 5 | 0 | 1 5 | N/A | N/A | N/A |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | **1 21** | **N/A** |
| Cadmium | Background | 240 | 0 1 5 | 13 33 | 1 5 | 1 8 6 | 1 55 | 0 99 |
| | IHSS 115 | 25 | 2 5 | 4 | 1 2 5 | 3 1 | 2 30 | 0 51 |
| | IHSS 133 | 8 | 2 5 | 0 | 1 2 5 | N/A | 1 81 | 0 75 |
| | Pre-TM15 | 14 | 2 5 | 0 | 2 5 | N/A | N/A | N/A |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | **1 63** | **N/A** |
| Calcium | Background | 257 | 15 7 5 000 | 100 | N/A | 1 700 184 000 | 55,205.54 | 32 672 70 |
| | IHSS 115 | 25 | 7 5 000 | 100 | N/A | 31 000 -- 235,500 | 98,824 00 | 54 032 61 |
| | IHSS 133 | 8 | 6 5 000 | 100 | N/A | 25,500 -- 72 900 | 43 850 00 | 14476 38 |
| | Pre-TM15 | 14 | 29 5 000 | 100 | N/A | 43,300 156,000 | 79,292 86 | 35 514 55 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | **83,648 94** | **5%** |
| Ces um | Background | 212 | 5 2 500 | 8 96 | 2 2,500 | 30 400 | 185 41 | 239 92 |
| | IHSS 115 | 26 | 20 1 000 | 0 | 10 500 | N/A | 393 42 | 198 81 |
| | IHSS 133 | 9 | 43 1 000 | 0 | 21 5 500 | N/A | 291 73 | 247 02 |
| | Pre-TM15 | 14 | 13 1 000 | 7 14 | 13 1 000 | 14 | 272.25 | 213 82 |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | **340.12** | **25%** |
| Chromium | Background | 250 | 2 10 | 24 | 1 13 6 | 2.2 23.2 | 4 40 | 3 57 |
| | IHSS 115 | 26 | 2 10 | 0 | 1 11 3 | N/A | 4 65 | 2 47 |
| | IHSS 133 | 8 | 2 10 | 0 | 1 5 | N/A | 3 00 | 2 14 |
| | Pre-TM15 | 14 | 3 10 | 0 | 3 10 | N/A | N/A | N/A |
| | | | | | | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | **3 02** | **N/A** |
| Cobalt | Background | 231 | 0 02 -- 50 | 9 52 | 2 50 | 2 9.5 | 6 08 | 8 53 |
| | IHSS 115 | 25 | 2 50 | 28 | 3 25 | 3 4 13 3 | 17 17 | 9 98 |
| | IHSS 133 | 9 | 2 50 | 11 | 1 25 | 5 1 | 12 18 | 12 23 |
| | Pre-TM15 | 14 | 4 50 | 14 29 | 5 50 | 5 7 11 1 | 11 45 | 10 72 |
| | | | | | | Mean of OL 5 Data and Percent Change from Pre-TM15 Mean | **14.87** | **27%** |
| Copper | Background | 250 | 2 25 | 28 4 | 1 68 5 | 1 3 175 | 5 74 | 12 68 |
| | IHSS 115 | 26 | 1 6 25 | 11 5 | 1 42 8 | 3 1 12 9 | 10 75 | 8 50 |
| | IHSS 133 | 9 | 1 6 25 | 11 | 0 8 44 7 | 2 3 | 11 09 | 13 8 |
| | Pre-TM15 | 14 | 2 25 | 0 | 2 25 | N/A | N/A | N/A |
| | | | | | | Mean of OU 5 ata and Perce t ha ge from Pre-TM15 Mean -- | **7 74** | **N/A** |

## Table 2-8 (Continued)

| Constituent (COCs are *Bold/Italic*) | OU 5 or Background Data | Number of Samples | Range of Reporting Limits (ug/l) | Percent Detection | Range of Non-detected Concentrations (ug/l) | Range of Detected Concentrations (ug/l) | Mean Concentration (ug/l) | Standard Deviation |
|---|---|---|---|---|---|---|---|---|
| Iron | Background | 256 | 4 7 100 | 62 5 | 2 1 106 5 | 2 8 8 790 | 86 61 | 554 79 |
| | IHSS 115 | 27 | 1 8 100 | 85 2 | 3 167 | 32 7 29 000 | 6 924 68 | 10 872 10 |
| | IHSS 133 | 9 | 1 8 100 | 78 | 0 9 6 8 | 2 1 628 | 161.23 | 208 91 |
| | Pre-TM15 | 14 | 5 100 | 78 57 | 5 45 7 | 24 7 34,900 | 8,636.80 | 10 489.84 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 6 186 65 | 28% |
| Lead | Background | 251 | 0 8 20 | 14 74 | 0 4 5 7 | 0 8 64 | 1 54 | 4 76 |
| | IHSS 115 | 26 | 0 9 -- 5 | 7 7 | 0 45 2 5 | 4 6 -- 5 7 | 1 89 | 1 15 |
| | IHSS 133 | 8 | 0 9 -- 5 | 13 | 0 45 2 5 | 0 92 | 1 35 | 0 97 |
| | Pre-TM15 | 14 | 1 3 | 0 | 1 3 | N/A | N/A | N/A |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | | | 1 28 | N/A |
| Lithium | Background | 250 | 2 100 | 70 4 | 1 100 | 1 2 250 | 33 44 | 54 22 |
| | IHSS 115 | 24 | 1 100 | 20 8 | 1 50 | 12 5 172 | 47 28 | 34 04 |
| | IHSS 133 | 8 | 1 100 | 50 | 50 | 10 6 20 | 31 54 | 19 97 |
| | Pre-TM15 | 14 | 2 100 | 35 71 | 17 100 | 4 2 30 | 14 96 | 11 90 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | | | 34.71 | 132% |
| Magnesium | Background | 254 | 0 1 5 000 | 96.08 | 28 5 5 000 | 2 355 46 300 | 10 015 78 | 8 302.90 |
| | IHSS 115 | 25 | 12 5 000 | 100 | N/A | 8 660 -- 68 900 | 20 942 80 | 13 316 92 |
| | IHSS 133 | 9 | 12 5 000 | 89 | 2 500 | 8 090 -- 17 000 | 9 887 78 | 3903.61 |
| | Pre-TM15 | 14 | 45 5 000 | 100 | N/A | 10,100 -- 22 200 | 15 307 14 | 4 005.23 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | | | 17 226.25 | 13% |
| ***Manganese*** | Background | 256 | 1 15 | 60 16 | 1 24 35 | 1 934 | 30 94 | 87 98 |
| | IHSS 115 | 24 | 0 6 -- 15 | 100 | N/A | 7 4 3,530 | 1 122 75 | 1 286.52 |
| | IHSS 133 | 8 | 0 6 -- 15 | 100 | N/A | 1 3 843 | 231 93 | 356.63 |
| | Pre-TM15 | 14 | 1 15 | 92 86 | 2 | 286 10 500 | 2 370 71 | 2,750 95 |
| | *Mean of OU 5 Data and Percent Change from Pre-TM15 Mean --* | | | | | | 1,347 84 | -43% |
| Mercury | Background | 207 | 0 02 0.2 | 2 42 | 0 1 0.24 | 0.2 0 69 | 0 11 | 0 06 |
| | IHSS 115 | 24 | 0.2 | 0 | 0 1 | N/A | 0 10 | 0 00 |
| | IHSS 133 | 9 | 0.2 | 0 | 0 1 | N/A | 0 10 | 0 |
| | Pre-TM15 | 14 | 0.2 | 0 | 0 2 | N/A | N/A | N/A |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | | | 0 07 | N/A |
| Molybdenum | Background | 241 | 3.5 200 | 28 63 | 2 200 | 2 114 | 19 18 | 34 02 |
| | IHSS 115 | 25 | 3 200 | 4 | 3 2 100 | 4 6 | 77 49 | 40 89 |
| | IHSS 133 | 9 | 3 200 | 11 | 1 5 100 | 12.2 | 57 81 | 50 12 |
| | Pre-TM15 | 14 | 7 200 | 0 | 11 200 | N/A | N/A | N/A |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | | | 51.20 | N/A |
| Nickel | Background | 238 | 0 02 40 | 22 03 | 2 40 | 2 35 8 | 6 48 | 6 89 |
| | IHSS 115 | 26 | 4 1 40 | 30 8 | 2 5 20 | 5 9 64 6 | 17 95 | 11 82 |
| | IHSS 133 | 8 | 4 1 -- 40 | 25 | 2 05 20 | 48 87 7 | 23 16 | 30 54 |
| | Pre-TM15 | 14 | 10 -- 40 | 0 | 10 40 | N/A | N/A | N/A |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 13 59 | N/A |
| Potassium | Background | 253 | 0 02 5 000 | 77 87 | 20 5 000 | 170 -- 8 110 | 1 346.50 | 1 078 02 |
| | IHSS 115 | 26 | 363 -- 5 000 | 50 | 2 500 7 810 | 783 -- 6 550 | 3 724 73 | 2,202 46 |
| | IHSS 133 | 8 | 381 -- 5 000 | 50 | 2 500 | 992 -- 1 540 | 1 879 00 | 679 89 |
| | Pre-TM15 | 14 | 640 -- 5 000 | 92 86 | 776 | 813 -- 6,110 | 2,397 07 | 1 696 68 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 3,029.87 | 26% |
| Selenium | Background | 220 | 1.2 10 | 28 64 | 1 5 | 1 607 | 8.29 | 44 80 |
| | IHSS 115 | 27 | 2 5 | 11 1 | 1 6 55 | 3 2 -- 5.2 | 2 19 | 1 31 |
| | IHSS 133 | 8 | 2 5 | 13 | 1 2 5 | 3.2 | 2 06 | 0 84 |
| | Pre-TM15 | 14 | 2 5 | 14 29 | 2 5 | 1.5 -- 2.3 | 1 52 | 0 64 |
| | *Mean of OU 5 Data and Percent Change from Pre-TM15 Mean --* | | | | | | 1 98 | 30% |
| Silver | Background | 238 | 2 25 | 19 92 | 2 10 | 2 4 13 600 | 60.29 | 885 11 |
| | IHSS 115 | 24 | 2 10 | 4 2 | 1 5 | 3 8 | 4 11 | 1 45 |
| | IHSS 133 | 8 | 2 10 | 0 | 1 5 | N/A | 3 06 | 2 07 |
| | Pre-TM15 | 14 | 3 10 | 0 | 3 0 | N/A | N/A | N/A |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | 2 68 | N/A |

## Table 2-8 (Continued)

| Constituent (COCs are ***Bold/Italic***) | U 5 or Background Data | Number of Samples | Range of Reporting Limits (ug/l) | Percent Detection | Range of Non-detected Concentrations (ug/l) | Range of Detected Concentrations (ug/l) | Mean Concentration ( g/l) | Standard Deviation |
|---|---|---|---|---|---|---|---|---|
| Sodium | Background | 255 | 10 5 000 | 98 82 | 10 5 000 | 4 060 252 000 | 31 887 46 | 43 627 69 |
| | HSS 115 | 26 | 10 5 000 | 96 2 | 2 500 | 7 440 192 000 | 34 492 31 | 41 256 34 |
| | IHSS 133 | 8 | 10 5 000 | 100 | N/A | 18 000 71 900 | 36,975 00 | 16874 13 |
| | Pre-TM15 | 14 | 55 5,000 | 100 | N/A | 12 400 44 000 | 28,057 14 | 10 540 03 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | **33 029 17** | **18%** |
| Stront um | Background | 253 | 0 7 200 | 92 89 | 100 1 000 | 51 05 7 930 | 351 76 | 564 63 |
| | HSS 115 | 24 | 0 3 200 | 100 | N/A | 225.5 1 480 | 600 35 | 340 45 |
| | HSS 133 | 8 | 0 3 200 | 100 | N/A | 175 -- 419 | 297 88 | 87 69 |
| | Pre-TM15 | 14 | 1 200 | 100 | N/A | 280 -- 754 | 475.29 | 157 06 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | **509 69** | **7%** |
| Thallium | Background | 214 | 0 1 200 | 5 14 | 0 6 10 | 1 328 | 3 50 | 23 34 |
| | 'HSS 115 | 26 | 1 10 | 7 7 | 0 5 7 15 | 3 9 -- 4 1 | 4 11 | 1 60 |
| | 'HSS 133 | 9 | 1 10 | 0 | 0 5 5 | N/A | 3 41 | 1 95 |
| | Pre-TM15 | 14 | 2 10 | 0 | 3 10 | N/A | N/A | N/A |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | | | **2 80** | **N/A** |
| Tin | Background | 236 | 0 1 1 000 | 28 81 | 2 200 | 10 7 8 830 | 66.55 | 574 12 |
| | IHSS 115 | 25 | 7 3 200 | 4 | 3 65 100 | 26.2 | 79 21 | 37 94 |
| | 'HSS 133 | 9 | 7 3 200 | 0 | 3 65 100 | N/A | 57 76 | 50 1 |
| | Pre-TM15 | 13 | 18 200 | 7 69 | 28 200 | 29 7 | 48 60 | 42 49 |
| | Mean of OU 5 D t and Percent Change from Pre-TM15 Mean | | | | | | **66 64** | **37%** |
| ***V nad um*** | Background | 249 | 1 2 50 | 53 82 | 1 50 | 2 05 19 6 | 7 32 | 8 00 |
| | HSS 115 | 27 | 1 4 -- 50 | 11 1 | 1 25 | 1 9 12 9 | 17 65 | 10 79 |
| | IHSS 133 | 9 | 1 4 -- 50 | 11 | 0 7 25 | 2 | 14 41 | 12.56 |
| | Pre-TM15 | 14 | 3 50 | 7 14 | 4 50 | 6 6 | 10 76 | 11 07 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | | | **15 14** | **41%** |
| Zinc | Background | 256 | 1 7 20 | 67 19 | 1 1 48 7 | 1 3 137 | 13 33 | 17 85 |
| | IHSS 115 | 26 | 1 20 | 73 1 | 1 10 | 3 4 69 7 | 18 64 | 16 14 |
| | 'HSS 133 | 9 | 1 20 | 78 | 4 4 14 | 4 1 23 8 | 12 44 | 7 16 |
| | Pre-TM15 | 14 | 3 20 | 42 86 | 3 20 | 2 9 46 8 | 8.38 | 11 56 |
| | Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | | | **14 57** | **74%** |

Notes OU 5 data where

IHSS 115 refers to groundwater samples obtained at IHSS 115 for the groundwater monitoring program as detailed in TM15

IHSS 133 refers to groundwater samples obtained at IHSS 133 for the groundwater monitoring program as detailed in TM15

Pre-TM15 efers to samples collected within OU 5 prior to January 1994

Mean and Standard Deviation are calculated assuming data are normally distributed

ug/l micrograms per liter N/A not applicable.

## Table 2 9

## Summary Statistics for Radionuclide Data from Groundwater Samples

| Constituent (COCs are ***Bold/Italic***) | OU 5 or Background Data | Number of Samples | Range of Activities (pCi/l) | Mean Activity (pCi/l) | Standard Deviation |
|---|---|---|---|---|---|
| **Total Activities** | | | | | |
| ***Americium 241*** | Background | 183 | 0 007 -- 0 1 | 0 006 | 0 01 |
| | IHSS 115 | 27 | 0 -- 0 06 | 0 01 | 0 01 |
| | IHSS 133 | 6 | 0 -- 0 01 | 0 00 | 0 |
| | Pre-TM15 | 15 | 0 007 -- 0 2 | 0 03 | 0 05 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean -- | | | | **0 02** | **-50%** |
| Plutonium 238 | Background | 15 | 0 001 -- 0 03 | 0 003 | 0 01 |
| | IHSS 115 | 20 | 0 01 -- 0 03 | 0 00 | 0 01 |
| | IHSS 133 | 5 | 0 | 0 00 | 0 |
| | Pre-TM15 | 2 | 0 005 -- 0 01 | 0 007 | 0 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 001** | **-93%** |
| ***Plutonium 239/240*** | Background | 194 | 0 006 -- 0 22 | 0 004 | 0 02 |
| | IHSS 115 | 26 | 0 -- 0 34 | 0 03 | 0 07 |
| | IHSS 133 | 6 | 0 -- 0 02 | 0 00 | 0 01 |
| | Pre-TM15 | 15 | 0 003 -- 1 04 | 0 098 | 0 26 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 05** | **-51%** |
| ***Uranium 233/234*** | Background | 35 | 0 -- 164 | 15 618 | 38 75 |
| | IHSS 115 | 15 | 0 -- 28 72 | 7 33 | 7 91 |
| | IHSS 133 | 4 | 0 69 -- 1 5 | 1 14 | 0 38 |
| | Pre-TM15 | 14 | 0 506 -- 49 | 9 667 | 12 25 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **7.57** | **22%** |
| ***Uranium 235*** | Background | 35 | 0 02 -- 6 29 | 0 617 | 1 38 |
| | IHSS 115 | 15 | 0 02 -- 1 57 | 0 34 | 0 41 |
| | IHSS 133 | 4 | 0 01 -- 0 07 | 0 04 | 0 04 |
| | Pre-TM15 | 14 | 0 055 -- 4 | 0 628 | 0 99 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 43** | **-32%** |
| ***Uranium 238*** | Background | 22 | 0 -- 108 | 10 84 | 27 73 |
| | IHSS 115 | 15 | 0 -- 30 74 | 7 53 | 9 79 |
| | IHSS 133 | 4 | 0 38 -- 1 5 | 1 07 | 0 51 |
| | Pre-TM15 | 14 | 0 399 -- 44 | 8 553 | 10 979 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **7 18** | **16%** |
| Alpha | Background | 23 | 0 351 362 | 43 497 | 94 28 |
| | IHSS 115 | 10 | 1 51 -- 73 | 24 52 | 23 18 |
| | IHSS 133 | 3 | 29 -- 40 | 34 37 | 5 5 |
| | Pre-TM15 | 14 | 8 1 1 600 | 213 275 | 408 8 |
| Mean of OU 5 Data and Percent Change from Pre TM15 Mean | | | | **123 49** | **-42%** |
| Beta | Background | 23 | 0 2 -- 220 | 24 945 | 53 34 |
| | IHSS 115 | 10 | 1 25 -- 65 | 20 70 | 19 42 |
| | IHSS 133 | 3 | 24 -- 45 04 | 32 35 | 11 18 |
| | Pre-TM15 | 14 | 5 5 -- 1 300 | 158 102 | 332 38 |
| Mean of OU 5 Data and Percent Change from Pre TM15 Mean | | | | **93.24** | **-41%** |
| Cesium 137 | Background | 156 | 0 594 -- 1 16 | 0 12 | 0 33 |
| | IHSS 115 | 1 | 0 6 0 6 | 0 60 | N/A |
| | Pre-TM15 | 1 | 0 38 | 0 38 | N/A |
| Mean of OU 5 Data and Percent Change from Pre TM15 Mean | | | | **0 49** | **29%** |

**Table 2 9 (Continued)**

| Constituent (COCs are ***Bold/Italic***) | OU 5 or Background Data | Number of Samples | Range of Activities (pCi/l) | Mean Activity (pCi/l) | Standard Deviation |
|---|---|---|---|---|---|
| ***Radium 226*** | Background | 6 | 0 182 -- 0 52 | 0 355 | 0 13 |
| | IHSS 115 | 3 | 1 62 -- 4 4 | 2 74 | 1 47 |
| | IHSS 133 | 3 | 0 58   1 7 | 1 13 | 0 56 |
| | Pre TM15 | 14 | 0 46 -- 4 4 | 2 462 | 1 63 |
| Mean of OU 5 Data and Percent Change from Pre TM15 Mean | | | | **2.30** | **-6%** |
| Strontium 89/90 | Background | 32 | 0 286 -- 1 12 | 0 215 | 0 28 |
| | IHSS 115 | 5 | 0 356 -- 1 2 | 0 819 | 0 40 |
| | IHSS 133 | 3 | 0 02 -- 0 47 | 0 30 | 0 25 |
| | Pre TM15 | 8 | 0 48 -- 1 5 | 0 567 | 0 62 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 60** | **5%** |
| Tritium | Background | 84 | 240   39 030 | 624 852 | 4 246 75 |
| | IHSS 115 | 9 | 39 3   322 2 | 162 869 | 89 60 |
| | IHSS 133 | 5 | 56 4 -- 270 6 | 134 08 | 131 65 |
| | Pre-TM15 | 5 | 240 -- 557 69 | 2 062 | 328 26 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **111 89** | **5526%** |
| **Dissolved Activities** | | | | | |
| ***Americium 241*** | Background | 2 | 0 003 -- 0 02 | 0 011 | 0 011 |
| | IHSS 115 | 3 | 0 0024 | 0 002 | 0 004 |
| | IHSS 133 | 3 | 0 -- 0 01 | 0 00 | 0 |
| | Pre-TM15 | 9 | 0 004 -- 0 02 | 0 004 | 0 006 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 002** | **-48%** |
| ***Plutonium 239/240*** | Background | 1 | 0 011   0 01 | 0 011 | N/A |
| | IHSS 115 | 5 | 0 0093 | 0 002 | 0 004 |
| | IHSS 133 | 3 | 0 | 0 00 | 0 |
| | Pre-TM15 | 9 | 0 004 -- 0 | 0 | 0 002 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 001** | **N/A** |
| ***Uranium 233/234*** | Background | 207 | 0 024 -- 199 5 | 6 914 | 25 439 |
| | IHSS 115 | 30 | 0 015 -- 15 055 | 3 131 | 3 703 |
| | IHSS 133 | 8 | 0 19 -- 1 39 | 0 60 | 0 47 |
| | Pre-TM15 | 19 | 0 188 -- 11 5 | 2 701 | 2 928 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **2 63** | **3%** |
| ***Uranium 235*** | Background | 207 | 0 037 -- 4 8 | 0 195 | 0 635 |
| | IHSS 115 | 30 | 0 0038 -- 0 846 | 0 151 | 0 177 |
| | IHSS 133 | 8 | 0 02   0 28 | 0 08 | 0 11 |
| | Pre-TM15 | 19 | 0 006 -- 0 53 | 0 162 | 0 162 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 14** | **11%** |
| ***Uranium 238*** | Background | 177 | 0 038   135 6 | 4 832 | 17 673 |
| | IHSS 115 | 30 | 0 011   27 575 | 2 810 | 5 145 |
| | IHSS 133 | 8 | 0 16 -- 3 59 | 1 04 | 1 14 |
| | Pre-TM15 | 19 | 0 1412   8 8 | 2 1087 | 2 154 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **2 33** | **10%** |
| Alpha | Background | 213 | 0 65 -- 312 7 | 8 354 | 32 315 |
| | IHSS 115 | 25 | 0 061   45 8 | 5 182 | 8 774 |
| | IHSS 133 | 8 | 0 22   1 36 | 0 87 | 0 44 |
| | Pre-TM15 | 19 | 0   27 | 5 162 | 6 023 |
| Mean of OU 5 Data and Percent Change from Pre TM15 Mean | | | | **4 51** | **13%** |

## Table 2 9 (Continued)

| Constituent (COCs are ***Bold/Italic***) | OU 5 or Background Data | Number of Samples | Range of Activities (pCi/l) | Mean Activity (pCi/l) | Standard Deviation |
|---|---|---|---|---|---|
| Beta | Background | 196 | 1 5 -- 135 9 | 4 892 | 12 23 |
| | IHSS 115 | 25 | 0 0096 -- 19 45 | 4 972 | 3 99 |
| | IHSS 133 | 8 | 0 35 -- 2 69 | 1 62 | 0 86 |
| | Pre TM15 | 19 | 1 41 230 | 17 661 | 51 529 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **9 09** | **-49%** |
| Cesium 137 | Background | 38 | 0 19 -- 2 6 | 0 42 | 0 525 |
| | IHSS 115 | 15 | 1 52 -- 0 95 | 0 11 | 0 58 |
| | IHSS 133 | 4 | 0 -- 0 71 | 0 26 | 0 32 |
| | Pre TM15 | 2 | 0 -- 0 08 | 0 04 | 0 057 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 13** | **230%** |
| ***Radium 226*** | Background | 36 | 0 055 -- 0 53 | 0 258 | 0 111 |
| | IHSS 115 | 2 | 0 0245 -- 0 889 | 0 457 | 0 612 |
| | Pre-TM15 | 7 | 0 2 -- 1 03 | 0 5 | 0 279 |
| Mean of OU 5 Data and Percent Change from Pre TM15 Mean | | | | **0 49** | **2%** |
| Strontium 89/90 | Background | 180 | 0 396 -- 1 8 | 0 338 | 0 306 |
| | IHSS 115 | 21 | 0 1131 -- 2 2 | 0 717 | 0 491 |
| | IHSS 133 | 8 | 0 1 -- 0 55 | 0 21 | 0 22 |
| | Pre-TM15 | 12 | 0 201 -- 1 83 | 0 603 | 0 497 |
| Mean of OU 5 Data and Percent Change from Pre-TM15 Mean | | | | **0 58** | **-3%** |

Notes = OU 5 data where

IHSS 115 refers to groundwater samples obtained at IHSS 115 for the groundwater monitoring program as detailed in TM15

IHSS 133 refers to groundwater samples obtained at IHSS 133 for the groundwater monitoring program as detailed in TM15

Pre-TM15 refers to samples collected within OU 5 prior to January 1994

= Mean and Standard Deviation are calculated assuming data are normally distributed

pCi/l = picocuries per liter N/A = not applicable

## Table 2 10
## Summary of Detected Organic Compounds in Groundwater Samples

| TM15 Program Chemical (COCs are in *Bold/Italics*) | Number of Samples | Range of Reporting Limits (ug/kg) | Percent of Samples Above Detection Limit | | Range of Nondetected Concentrations (ug/kg) | Range of Detected Concentrations (ug/kg) | Maximum Concentration *Pre-TM15* (ug/kg) |
|---|---|---|---|---|---|---|---|
| | | | TM15 | *Pre-TM15* | | | |
| **115GW** | | | | Volatile Organic Compounds | | | |
| 1 1 1 Trichloroethane | 31 | 0 5 – 10 | 6 | *5* | 0 25 – 5 | 0 3 – 9 | *40* |
| 1 1 2 2 Tetrachloroethane | 31 | 0 5 – 10 | 3 | *0* | 0 25 – 5 | 4 | *10* |
| 1 1 2 Trichoroethane | 31 | 0 5 – 10 | 3 | *0* | 0 25 – 5 | 2 | *10* |
| 1 1 Dichoroethanel | 31 | 0 5 – 10 | 6 | *0* | 0 25 – 5 | 0 4 – 1 | *10* |
| 1 1 Dichoroethanel | 31 | 0 5 – 10 | 10 | *5* | 0 25 – 5 | 2 – 5 | *32 5* |
| 1 2 Dichoroethanel | 26 | 5 10 | 12 | *5* | 2 5 – 5 | 1 – 3 | *4* |
| Acetone | 25 | 10 | 4 | *5* | 5 | 8 | *4 5* |
| *Carbon Disulfide* | 26 | 5 – 10 | 4 | *0* | 2 5 – 5 | 1 | *10* |
| cis-1 2 Dichloroethene | 5 | 0 5 | 40 | *0* | 0 25 | 3 | *0 2* |
| Mthylene Chloride | 31 | 0 5 10 | 16 | *5* | 0 25 – 5 | 2 – 4 | *6* |
| Tetrachloroethene | 31 | 0 5 – 10 | 16 | *0* | 0 25 – 5 | 0 78 – 24 | *10* |
| Toluene | 31 | 0 5 – 10 | 3 | *0* | 0 25 – 5 | 0 3 | *<10* |
| Trichloroethene | 31 | 0 5 – 10 | 16 | *5* | 0 25 – 5 | 2 – 50 5 | *150* |
| | | | | Semi-Volatile Organic Compounds | | | |
| 1 2 3-Trichlorobenzene | 5 | 0 5 | 20 | *0* | 0.25 | 0 2 | *0 2* |
| 2 4-Dimethylphenol | 26 | 10 – 14 | 4 | *0* | 5 – 100 | 2 | *10* |
| 2 Methylphenol | 26 | 10 – 14 | 4 | *0* | 5 – 100 | 1 | *10* |
| 4-Isopropyltoluene | 5 | 0 5 | 20 | *0* | 0 25 | 0 2 | *0 2* |
| 4-Methylphenol | 26 | 10 – 14 | 3 8 | *0* | 5 – 100 | 3 | *10* |
| Aceaphthene | 26 | 10 – 14 | 11 5 | *20* | 5 – 100 | 2 – 4 | *5* |
| Anthracene | 26 | 10 – 14 | 3 8 | *0* | 5 – 100 | 0 5 | *10* |
| Bis(2 Ethylhexyl)Phthalate | 26 | 10 – 14 | 34 6 | *20* | 5 – 100 | 1 – 6 | *3* |
| Butly Benzyl Phthalate | 26 | 10 – 14 | 3 8 | *0* | 5 – 100 | 3 | *10* |
| Carbazole | 22 | 10 – 14 | 4 5 | *0* | 5 – 100 | 4 | *10* |
| Di-*n*-Butly Phthalate | 26 | 10 – 14 | 15 4 | *6 7* | 5 – 100 | 0 5 – 3 | *2* |
| Dibenzofuran | 26 | 10 – 14 | 3 8 | *0* | 5 – 100 | 2 | *10* |
| Diethyl Phthalate | 26 | 10 – 14 | 23 1 | *6 7* | 5 – 100 | 0 7 – 5 | *6* |
| Fluoranthene | 26 | 10 – 14 | 11 5 | *20* | 5 – 100 | 1 – 4 | *4* |
| Fluorene | 26 | 10 – 14 | 7 7 | *20* | 5 – 100 | 2 – 3 | *4* |
| Naphthalene | 32 | 0 5 – 14 | 9 4 | *11 8* | 0 25 – 100 | 0 6 – 16 | *13* |
| Phenanthrene | 26 | 10 – 25 | 11 5 | *20* | 5 – 100 | 1 – 4 | *6* |
| Pyrene | 26 | 10 – 14 | 11 5 | *20* | 5 – 100 | 1 – 3 | *6 5* |
| **133GW** | | | | Volatile Organic Compounds | | | |
| Methylene Chloride | 13 | 5 – 10 | 15 | *5* | 2.5 – 5 | 2 – 4 | *6* |
| Acetone | 10 | 10 | 10 | *0* | 5 | 27 | *4 5* |
| | | | | Semi-Volatile Organic Compounds | | | |
| Bis(2 Ethylhexy)Phthalate | 7 | 10 | 14 | *20* | 5 | 2 | *3* |
| Butyl Benzyl Phthalate | 7 | 10 | 14 | *0* | 5 – 18 | 4 | *10* |
| Di-n Butyl Phthalate | 7 | 10 | 14 | *6 7* | 5 | 2 | *2* |
| Di-n-Octyl Phthalate | 7 | 10 | 14 | *0* | 5 | 3 | *10* |

Notes OU 5 data where;

115GW refers to groundwater samples obtained at IHSS 115 for the groundwater monitoring program as detailed in TM15

133GW refers to groundwater samples obtained at IHSS 133 for the groundwater mon toring program as detailed in TM15

Mean and Standard Deviation are calculated assuming data are normally distr buted

ug/l micrograms per liter N/A not applicable.

## Table 2 11
## OU 5 Wind Resuspension Potential Study Results

| Location | Aggregate Size Mode Estimate (mm) | Threshold Friction Velocity u t Uncorrected (cm/s) (Figure 3-4) (1) | Bare Soil (m 2) (2) | Vegetation Coverage (m 2) (2 3) | Other Nonerodible Coverage (m 2) (2 3) | Vertical Fraction Embedded |
|---|---|---|---|---|---|---|
| 115AQ1 | 4 00 | 115 | 0 30 | 0 35 | 0 65 | 0 35 |
| 115AQ2 | 3 00 | 100 | 0 60 | 0 15 | 0 25 | 0 50 |
| 115AQ3 | 4 00 | 155 | 0 40 | 0 35 | 0.25 | 0 50 |
| 115AQ4 | 4 00 | 115 | 0 20 | 0 05 | 0 80 | 0 50 |
| 115AQ5 | 1 50 | 75 | 0 15 | 0 80 | 0.25 | 0 50 |
| 115AQ6 | 0 50 | 50 | 0 10 | 0 90 | 0 10 | 0 75 |
| 115AQ7 | 0 75 | 58 | 0 55 | 0 40 | 0 15 | 0 50 |
| 115AQ8 | 4 00 | 115 | 0 10 | 0 90 | 0 65 | 0 50 |
| 115AQ9 | 1 50 | 75 | 0 05 | 0 95 | 0 15 | 0 50 |
| 115AQ10 | 0 75 | 58 | 0 05 | 0 95 | 0 03 | 0 80 |
| 115AQ11 | 3 00 | 100 | 0 05 | 0 95 | 0.25 | 0 50 |
| 115AQ12 | 1 50 | 75 | 0 00 | 1 00 | 0 05 | 0 50 |
| 115AQ13 | 1 00 | 65 | 0 25 | 0 75 | 0 10 | 0 50 |
| 115AQ14 | 4 00 | 115 | 0 00 | 1 00 | 0 70 | 0 50 |
| 115AQ15 | 0 75 | 58 | 0 00 | 1 00 | 0 30 | 0 80 |
| SASH AQ16 | 0 75 | 58 | 0 20 | 0 80 | 0 30 | 0 50 |
| SASH AQ17 | 0 30 | 40 | 0 03 | 0 97 | 0 30 | 0 50 |
| 209AQ18 | 4 00 | 115 | 0.25 | 0 40 | 0 40 | 0 50 |
| 209AQ19 | 4 00 | 115 | 0 20 | 0 30 | 0.50 | 0 50 |
| 209AQ20 | 4 00 | 115 | 0 10 | 0 50 | 0 65 | 0 80 |
| W209AQ21 | 0 50 | 50 | 0 10 | 0 90 | 0 15 | 0 50 |
| W209AQ22 | 0 75 | 58 | 0 10 | 0 90 | 0 03 | 0 50 |
| OU3T 1AQ23 | 0 30 | 40 | 0.25 | 0 70 | 0 05 | 0.25 |
| OU3T 2AQ25 | 0 50 | 50 | 0 35 | 0 60 | 0 15 | 0.20 |
| OU3T 3AQ24 | 2 00 | 88 | 0 05 | 0.25 | 0 70 | 0 50 |
| OU3T-4AQ26 | 0 50 | 50 | 0 85 | 0 10 | 0 10 | 0 50 |

## Table 2 11 (Continued)

| Location | Equivalent Frontal Area of Nonerodible Elements (m 2) (Coverage [1-emb frac ]) | Lc (Eq Front Area/Area of Bare Soil) | Correction Ration (Figure 3 5) (1 4) | Threshold Friction Velocity u t Corrected (cm/s) ([u t]/[Ratio]) | Equivalent 10-m Wind Speed (mph) (5) |
|---|---|---|---|---|---|
| 115AQ1 | 4225 | 1 4 | 10 | 1150 | 418 |
| 115AQ2 | 125 | 2 | 10 | 1000 | 364 |
| 115AQ3 | 125 | 3 | 10 | 1150 | 418 |
| 115AQ4 | 4 | 2 | 10 | 1150 | 418 |
| 115AQ5 | 125 | 8 | 10 | 750 | 273 |
| 115AQ6 | 025 | 3 | 10 | 50 | 182 |
| 115AQ7 | 075 | 1 | 7 | 406 | 148 |
| 115AQ8 | 325 | 3 3 | 10 | 1150 | 418 |
| 115AQ9 | 075 | 1 5 | 10 | 750 | 273 |
| 115AQ10 | 015 | 3 | 10 | 580 | 211 |
| 115AQ11 | 0625 | 1 3 | 10 | 1000 | 364 |
| 115AQ12 | 025 | #Div/01 | infinite | infinite | infinite |
| 115AQ13 | 05 | 2 | 10 | 650 | 236 |
| 115AQ14 | 35 | #Div/01 | infinite | infinite | infinite |
| 115AQ15 | 06 | #Div/01 | infinite | infinite | infinite |
| SASH-AQ16 | 15 | 8 | 10 | 580 | 211 |
| SASH-AQ17 | 15 | 5 | 10 | 400 | 145 |
| 209AQ18 | 2 | 8 | 10 | 1150 | 418 |
| 209AQ19 | 25 | 1 3 | 10 | 1150 | 418 |
| 209AQ20 | 13 | 1 3 | 10 | 1150 | 418 |
| W209AQ21 | 075 | 8 | 10 | 500 | 182 |
| W209AQ22 | 0125 | 1 | 7 | 406 | 148 |
| OU3T 1AQ23 | 0375 | 2 | 10 | 400 | 145 |
| OU3T 2AQ25 | 12 | 3 | 10 | 500 | 182 |
| OU3T 3AQ24 | 35 | 7 | 10 | 880 | 320 |
| OU3T-4AQ26 | 05 | 1 | 7 | 350 | 127 |

**Table 2 12**
**Comparison of Results of 1993 Wind Tunnel Study and 1995 Rapid Assessment Method**

| OU 3 Location | Threshold Friction Velocity (cm/s) | |
|---|---|---|
| | 1993 Wind Tunnel Study (1) | 1995 Rapid Assessment Method |
| T 1 | >280 | 400 |
| T 2 | >170 | 500 |
| T 3 | >180 | 880 |
| T 4 | >160 | 350 |

Note (1) Source DOE 1994c

## Table 2 13

## Summary of Radionuclide Data for Surface Soils from IHSS 209 and Other Surface Disturbances

| Location | Sample Number | Chemical | Results | Units | Error | Qualifier | Validation |
|---|---|---|---|---|---|---|---|
| SS133194 | SS00001AS | Americium 241 | 0 182 | PCI/G | 0 061 | | V |
| SS133?94 | SS00002AS | Americium 242 | 0 042 | PCI/G | 0 020 | | V |
| SS133394 | SS00003AS | Americium 243 | 0 619 | PCI/G | 0 098 | | V |
| SS133494 | SS00004AS | Americium 244 | 0 582 | PCI/G | 0 107 | | V |
| SS133594 | SS00005AS | Americium 245 | 0 432 | PCI/G | 0 088 | | V |
| SS133694 | SS00006AS | Americium 246 | 0 456 | PCI/G | 0 091 | | V |
| SS133794 | SS00007AS | Americium 247 | 0 071 | PCI/G | 0 032 | | V |
| SS133894 | SS00008AS | Americium 248 | 0 045 | PCI/G | 0 032 | | V |
| SS133894 | SS00009AS | Americium 249 | 0 018 | PCI/G | 0 018 | | V |
| SS133194 | SS00001AS | Plutonium 239/240 | 0 771 | PCI/G | 0 141 | | V |
| SS133?94 | SS00002AS | Plutonium 239/241 | 0 206 | PCI/G | 0 052 | | V |
| SS133394 | SS00003AS | Plutonium 239/242 | 3 252 | PCI/G | 0 376 | | V |
| SS133494 | SS00004AS | Plutonium 239/243 | 3 253 | PCI/G | 0 390 | | V |
| SS133594 | SS00005AS | Plutonium 239/244 | 2 119 | PCI/G | 0 413 | | V |
| SS133694 | SS00006AS | Plutonium 239/245 | 2 452 | PCI/G | 0 307 | | V |
| SS133794 | SS00007AS | Plutonium 239/246 | 0 199 | PCI/G | 0 050 | | V |
| SS133894 | SS00008AS | Plutonium 239/247 | 0 064 | PCI/G | 0 042 | | V |
| SS133894 | SS00009AS | Plutonium 239/248 | 0 052 | PCI/G | 0 028 | | V |

SS00009AS is a field duplicate of SS00008AS
Refer to Figures 2 16 and 2 17 for sample locations

## Table 2 14
## Comparison of Concentrations of Organic Chemicals in TM15 Subsurface-Soil Samples with Risk Based Concentrations (RBCs)

| Chemical | Residential Soil RBC (mg/kg) | Maximum Detected Concentration (mg/kg) | Maximum Detect Concentration Exceeds RBC? | Maximum Nondetected Concentration (mg/kg) | Maximum Nondetected Concentration Exceeds RBC? |
|---|---|---|---|---|---|
| Bis(2-ethylhexyl)phthalate | 4 57E+01 | 5 4E-01 | No | 5 3E-01 | No |
| Bromoform | 8 11E+01 | 2 0E-03 | No | 1 4E-02 | No |
| Butylbenzyl phthalate | 5 4E+04 | 2 1E+00 | No | 1 14E+00 | No |
| Cholorform | 1 05E+02 | 3 6E-02 | No | 1 3E-02 | No |
| Diethyl phthalate | 2 2E+05 | 8 9E-01 | No | 1 0E+00 | No |
| Di-n-octyl phthalate | 5 49E+03 | 5 0E-02 | No | 8 9E-01 | No |
| Methylene chloride | 8 54E+01 | 1 5E-01 | No | 3 0E-02 | No |

Source DOE (1995d)

## Table 2 15
## Comparison of Concentrations of Organic Chemicals in TM15 Groundwater with Risk Based Concentrations (RBCs)

| Chemical | Residential Groundwater RBC (mg/l) | Maximum Detected Concentration (mg/l) | Maximum Detect Concentration Exceeds RBC? | Maximum Nondetected Concentration (mg/l) | Maximum Nondetected Concentration Exceeds RBC? |
|---|---|---|---|---|---|
| Compolunds Not Detected in Samples Prior to TM15 | | | | | |
| Anthracene | 1 9E+01 | 5 0E-04 | No | 0 1 | No |
| Butyl benzyl phthalate | 7 3E+00 | 4 0E-03 | No | 1 0E-01 | No |
| C rbazole | NA | 4 0E-03 | NA | 1 0E-01 | NA |
| Carbon Disulfide | 2.76E-02 | 1 0E-03 | No | 5 0E-03 | No |
| Dibenzofuran | NA | 2 0E-03 | NA | 1 0E-01 | NA |
| 1 1 Dichloroethane | 1 01E+00 | 1 0E-03 | No | 5 0E-03 | No |
| Cis 1,2-dichloroethene | 3 28E-01 | 3 0E-03 | No | 2.5E-04 | No |
| 2 4-Dimethylphenol | 7 3E-01 | 2.0E-03 | No | 1 0E-01 | No |
| 4-Isopropyltoluene | NA | 2 0E-04 | NA | 2.5E-04 | NA |
| 2 Methylphenol | 1 83E+00 | 1 0E-03 | No | 1 0E-01 | No |
| Di-n-octyl phthalate | 7 3E-01 | 3 0E-03 | No | 5 0E-03 | No |
| 1 1 2,2-Tetrachloroethane | 8 95E-05 | 4 0E-03 | Yes** | 5 0E-03 | Yes** |
| Tetrachloroethene | 1 43E-03 | 2.4E-02 | Yes** | 5 0E-03 | Yes* |
| Toluene | 9 65E-01 | 3.0E-04 | No | 5 0E-03 | No |
| 1 2 3-Trichlorobenzene | NA | 2.0E-04 | NA | 2.5E-04 | NA |
| 1 1 2 Trichloroethane | 3 18E-04 | 2.0E-03 | Yes** | 5 0E-03 | Yes* |
| Compolunds Detected at Lower Concentrations in Samples Collected Prior to TM15 | | | | | |
| Acetone | 3 65E+00 | 2.7E-02 | NO | 5 0E-03 | No |
| Bis(2-ethylhexyl)phthalate | 6 07E-03 | 6 0E-03 | NO | 1 0E-01 | Yes* |
| Di-n-butyl phthalate | 3 65E+00 | 3 0E-03 | NO | 1 0E-01 | No |
| Naphthalene | 1 46E+00 | 1 6E-02 | NO | 1 0E-01 | No |

Source DOE (1995d) ** These concentrations are less than 1 000 times the RBC

# 3 0 PHYSICAL CHARACTERISTICS OF OU 5

This section provides a broad picture of the physical setting of and around OU 5 More specifically this section discusses the physiographic features within and surrounding OU 5 the demography and land use of both OU 5 and the surrounding areas as well as the climate hydrology geology and hydrogeology of the area encompassing OU 5 (Figure 3 1)

## 3 1 PHYSIOGRAPHIC FEATURES

### 3 1 1 Regional

The Site is located on the western margin of the Colorado Piedmont section of the Great Plains Physiographic Province at an elevation of approximately 6 000 feet above mean sea level (MSL) on a broad eastward sloping plain of coalescing alluvial fans The Colorado Piedmont terminates abruptly on the west at the Front Range section of the Southern Rocky Mountain Province (EG&G 1995a)

The Colorado Piedmont is characterized as an area of dissected topography and denudation representing an old erosional surface along the eastern margin of the Rocky Mountains The piedmont surface is broadly rolling and slopes gently to the east with a topographic relief of only several hundred feet Drainages have been incised and portions of the alluvial cover have been removed by more recent erosional processes (Scott, 1963) The Site occupies an area on the eastern edge of the piedmont. In the eastern portions of the Rocky Flats Alluvium pediment the nearly flat lying surface gives way to lower gently rolling terrain of the High Plains section of the Great Plains Physiographic Province (EG&G 1995a)

The eastern margin of the Front Range from approximately four miles west of the Site is characterized by a narrow zone of hogback ridges formed by steeply east dipping Paleozoic and Mesozoic aged strata (the Fountain formation and the Dakota Group respectively) Less resistant sedimentary strata were removed by erosion Approximately fifteen miles west of the Site the Front Range reaches elevations of 12 000 to 14 000 feet about MSL A Precambrian age basement comprised of igneous and metamorphic rock assemblages make up the core of the Front Range

Several pediments were developed across both hard and soft bedrock in the area of the Site during the Quaternary period (Scott 1963) The Rocky Flats pediment is the most extensive of these forming a broad flat surface east of Coal Creek The broad pediments and narrow terraces are covered by thin alluvial deposits of ancient streams that once drained eastward into the Great Plains The sequence of pediments reflects repetitive physical processes associated with cyclic changes in climate Each erosional surface and stratigraphic sequence deposited on it probably represents a single glacial cycle The oldest and highest pediment the Subsummit Surface (Scott 1960) truncates the hogback ridges of the Front Range Three successively younger pediments veneered by alluvial gravels (including the Rocky Flats Alluvium) extend eastward from the mountain front Erosion of valleys into the pediments followed each depositional cycle so that near the mountain fronts stratigraphically younger geologic units occur at topographically lower elevations as narrow terrace deposits along the streams These alluvial deposits in the OU 5 area are described in Section 3 6 1

The industrial area of the Site is located on a relatively flat surface of Rocky Flats Alluvium (Figure 3 1) The pediment surface has been eroded by Walnut Creek on the north and Woman Creek on the south subsequently terraces along these streams range in height from 50 feet to 150 feet. The grade of the gently eastward sloping surface of the Rocky Flats Alluvium varies from 0 7 percent in the industrial area of the Site to approximately 2 percent just east of the industrial area.

Surface water that flows from the northern portion of the Site is drained by Rock Creek, which is a northeast trending tributary of Coal Creek The central and southern portions of the site are drained by Walnut Creek South Walnut Creek, and Woman Creek. These drainages are all ephemeral tributaries of Big Dry Creek that flow eastward Coal Creek separates all of the streams on the Rocky Flats Alluvium pediment from the Front Range foothills Small drainage basins and low recharge from snowmelt or rainfall at higher elevations account for the ephemeral nature of the creeks (EG&G 1995a)

### 3 1 2 OU 5 Area

The OU 5 study area consists of 11 IHSSs located along the Woman Creek Drainage including the Original Landfill (IHSS 115) the Water Treatment Plant Filter Backwash Pond (IHSS 196) the Ash Pits (IHSSs 133 1 through 133 4 and two previously unidentified ash pits) the Incinerator (IHSS 133 5) the Concrete Wash Pad (IHSS 133 6) Detention Ponds C 1 and C 2 (IHSSs 142 10 and 142 11 respectively) and Surface Disturbance (IHSS 209) Also included are two additional areas of surface disturbances the Surface Disturbance South of the Ash Pits and the Surface Disturbance West of IHSS 209 (Figure 3 1)

The near surface geologic materials at OU 5 consist of alluvium colluvium valley fill alluvium and artificial fill that unconformably overlay bedrock Artificial fill and disturbed ground occur in localized areas including the landfill the ash pits and the C 1 and C 2 dams

## 3 2 DEMOGRAPHY AND LAND USE

Based on information provided by the Population Economic and Land Use Database for the Site (DOE 1995c) there are no residents within two miles of the industrial area of the Site and there are no predicted changes in population density through the year 2015 Exact numbers concerning current and future population trends of the plant site are not available The Site was the largest manufacturing employer in the Denver Metro Area in 1994 employing approximately 6 500 people However as the mission changed from production to environmental restoration employment numbers may continue to decrease until environmental work is complete (DOE 1995c)

Land use in the vicinity of the Site consists of residential and limited commercial development parks open space agricultural land and vacant land Increased residential development has occurred within five miles of the Site within the last five years Within five miles of Rocky Flats most residential land use including changes from other land use categories to residential land use occurs immediately north east, and south of Standley Lake Small parcels of unincorporated residential land are located to the west, northwest and north of Rocky Flats (DOE 1995c)

There is limited commercial development within five miles of the plant The primary exception is the commercial activity servicing the Jefferson County Airport. Industrial land uses within five miles of Rocky Flats are limited to quarrying and mining operations (DOE 1995c) Other land uses within approximately five miles of the Site include parks and open space agricultural land and vacant land (DOE 1995c) Land uses more specific to OU 5 are discussed below

Current activities within OU 5 consist of environmental investigations monitoring cleanup and routine security surveillance Site operations and maintenance activities are not conducted within OU 5 according to TM12 Exposure Assessment HHRA (DOE 1995b) OU 5 is currently occupied for the most part by wildlife and will most likely be preserved as open space or as an ecological reserve

Ecological surveys of the buffer zone performed in compliance with the Threatened and Endangered Species Act, have identified the presence of several listed species at the Site Because the Site buffer zone including OU 5 has not been impacted by commercial development for many years thus allowing progressive re establishment of quality native habitats the future use of this area as an ecological reserve is reasonable The Jefferson County Board of Commissioners has also adopted a resolution stating its support of maintaining in perpetuity the undeveloped buffer zone of open space around the Site for environmental safety and health reasons (DOE 1995b) However portions of OU 5 with suitable topography will be evaluated further for construction of and subsequent use as an office complex (DOE 1995b)

## 3 3 METEOROLOGY AND CLIMATOLOGY

Meteorology at the Site is influenced by its proximity to the Front Range The Site is four miles east of the Front Range and the ground elevation rises along the Front Range from 6 000 feet to more than 10 000 feet at a distance of only 20 miles to the west The Site operates a 200 foot meteorological tower that is positioned approximately 1 2 miles northwest of OU 5 This tower provides meteorological data that are representative of the general conditions at the Site It gives the nearest and therefore the most useful meteorological information applicable to OU 5

The predominant wind direction at the Site is from the west and northwest These winds tend to have greater speeds than winds out of the east and south (EG&G 1991b) The average annual wind speed in 1991 was 8 7 mph (EG&G 1991b) Wind speeds greater than 20 mph occur between 500 and 600 hours per year at the Site (DOE 1980) During the winter and spring months these strong winds called chinooks are associated with continental air masses moving over the Rocky Mountains These winds have been recorded exceeding 120 mph at the Site (DOE 1980) During the summer months localized thunderstorms account for strong wind conditions which are typically less intense than winter wind phenomena However the more characteristic if not so dramatic airflow pattern at the Site is the daily cycle of mountain and valley breezes During the night relatively cooler air flows off the east slope of the mountains and displaces warmer air at lower elevations The wind rose for night hours in Figure 3 2 shows this strong westerly component (EG&G 1991b) Canyons creek drainages and ridges tend to channel these downslope winds as they move onto the plains The downslope flows converge with the South Platte River Valley air flow moving to the north northeast During the daytime hours solar insolation heats up the air along the slopes of the mountains more quickly than the air over the plains and valleys This warming causes breezes to move upslope out of the valleys toward the mountains Upslope conditions tend to be less pronounced and less channelized than downslope conditions (EG&G 1991b) There are spatial and temporal distinctions in the shift from downslope to upslope conditions along the Front Range The change typically occurs an hour or two earlier in the morning in the vicinity of the Site than at locations on the east side of the Denver Basin (DOE 1980)

According to the Pasquill classification atmospheric stability is most frequently neutral (Class D) at the Site During 1991 Class D cases occurred 46 2 percent of the time Stable conditions Pasquill Classes E and F occurred 42 6 percent of the time Unstable cases Classes A B and C occurred only 11 2 percent (EG&G 1991b) Unstable atmospheric conditions enhance vertical pollutant mixing Stable conditions oppose atmospheric turbulence

The climate at the Site is characterized as semi arid Annual climate summaries during 1993 indicated that the 1993 mean temperature of 45 7 F was more than 2 F below the average annual temperature The annual temperature extremes ranged from a high of 91 F on July 10 and 29 to a low of 10 F on February 16 and November 25 The 1993 peak wind gust of 82 mph occurred on December 31 Precipitation during the year was more than 3 inches below normal totaling 12 07 inches The largest daily precipitation fell on June 7 when 1 15 inches of rain was recorded The largest 15 minute rainfall of 0 15 inches was recorded on March 28 Monthly precipitation ranged from 1 79 inches in June to 0 13 inches in January (EG&G 1993b) Approximately 40 percent of the annual precipitation falls during the spring season much of it as snow Thunderstorms during the summer months provide another 30 percent of the annual precipitation (EG&G 1993b) These thunderstorm events can be intense On August 6 1991 for example 1 15 inches of rain fell within two hours (EG&G 1991b)

## 3 4 SOILS

Soils within the OU 5 area have been classified by the Soil Conservation Service Department of Agriculture (Price and Amen 1980) The location and lateral extent of these soil types within the OU 5 area were digitized from Digital Line Graph (DLG) data from the Soil Conservation Service (Digital ARC/Info Coverage provided by EG&G RFETSSOIL Coverage) and are presented in Figure 3 6 Table 3 1 lists the major soil units within the OU 5 area with their classifications and properties

Most of the soil series shown on Table 3 4 1 are classified within the Argiustoll great group Argiustolls are generally characterized as well-drained with dark-colored humus rich surface A horizons argillic B horizons and calcic C horizons They exit in aridic and ustic (limited moisture) regimes which are adequate for plant growth during the growing season The two predominant subgroups are Torretic and Aridic Torretic Argiustolls typically have a higher shrink swell potential than Aridic Argiustolls (Price and Amen 1980)

The predominant soil type within OU 5 are clay loams of the Denver Kutch Midway group (Price and Amen 1980) These soils occur along the Woman Creek drainage (Figure 3 6) Slope gradients for these soils range from 9 to 25 percent, with the Denver and Kutch soils typically located on the hillslopes of the drainages while the Midway soils are found on the ridge crests The Denver clay loams consist of deep well-drained calcareous clay silty clay and sandy clay material derived primarily from claystones siltstones and sandstones The Kutch soils are moderately deep well-drained calcarious clayey alluvium and colluvium derived from claystones siltstones and sandstones and from Rocky Flats Alluvium and terrace alluviums The Midway clay loams are shallow well-drained calcarious clayey material derived form Rocky Flats Alluvium These soils have low permeability and infiltration rates which result in a severe water erosion hazard

The Woman Creek drainage is covered by the Haverson loam (0 3 percent slopes) (Figure 3 6) This soil type is also present downgradient of Antelope Spring and at IHSS 209 The Haverson loam is a deep well drained stratified alluvium derived from Rocky Flats Alluvium and terrace alluviums and bedrock claystones siltstones and sandstones (Price and Amen 1980) The infiltration rate and permeablilty for this soil is slow and moderate/slow respectively This soil type is associated with slight water erosion hazards and low shrink swell potential

The Leyden Primen Standley cobbly clay loams (15 to 50 percent slopes) have limited areal extent east of Pond C 2 and north of the Woman Creek Drainage (Figure 3 6) The Leyden Primen Standley series is derived from the Rocky Flats Alluvium terrace alluvium and bedrock claystones The soil consists of clayey gravelly stony and cobbly material which constitute clayey montmorillonticic mesic Aridic

Argiustolls This series displays a slow infiltration and a slow permeability severe water erosion hazard and moderate to high potential for shrinkage swelling Leyden soils are moderately deep and well drained consisting of calcareous cobbly and clayey material The Primen soils are shallow and well drained Standley soils are deep and well drained (Price and Amen 1980)

The Flatirons very cobbly sandy loams (0 to 3 percent slopes) are only found on ridge tops that consist predominately of Rocky Flats Alluvium The Surface Disturbance South of the Ash Pits IHSS 133 5 and the north side of IHSS 115 are all characterized by this soil type (Figure 3 6) The Flatirons soil is deep and well drained and is formed in noncalcareous cobbly stony gravelly and loamy material of the Rocky Flats Alluvium Slow infiltration rate slow permeability slight water erosion hazard and a moderate shrink swell potential are associated with this soil type (Price and Amen 1980)

The Nederland soil skirts the Flatiron soils along the ridges and hillsides of the OU 5 area and consists of very cobbly sandy loam which forms slopes of 15 to 50 percent (Figure 3 6) This soil is deep and well drained and formed in cobbly gravelly and loam alluvium derived from the Rocky Flats Alluvium and terrace alluviums This soil has moderate permeability and infiltration rate a severe water erosion hazard and low shrink swell potential (Price and Amen 1980)

## 3 5 HYDROLOGY

Appendix A (Hydrologic Data Summary Report) provides detailed information regarding the hydrology of OU 5 OU 5 is located within the Woman Creek drainage basin (Figure 3 1) in which water generally flows from west to east. The Woman Creek drainage basin extends eastward from the base of the foothills near the mouth of Coal Creek Canyon to Standley Lake The portion of the basin that lies within the study area (headwaters to Indiana Street) consists of approximately 2 884 acres The long term average annual yield generated by this basin is 32 1 acre feet, with significant average storms producing surface flows of 4 to 7 cubic feet per second (cfs) During extreme precipitation events (greater than 15 year return occurrence based on precipitation) surface flows up to 40 cfs have been generated Although seasonal flows can be low Woman Creek receives continuous flow from Antelope Springs Creek Woman Creek drains OU 5 and discharges via Mower Ditch into Mower Reservoir and Standley Lake During periods of high flow Woman Creek may discharge directly to Standley Lake (DOE 1994b)

Detention Ponds C 1 and C 2 are located within the eastern reach of the Woman Creek basin Pond C 1 is located on the Woman Creek channel Pond C 2 is located off the Woman Creek channel Pond C 2 receives relatively minor local flow from its surrounding drainage basin while receiving the bulk of its flow from the South Interceptor Ditch which lies on the northern flank of the Woman Creek basin (Figure 3 1) and crosses under the Woman Creek Diversion Ditch before emptying into the pond The South Interceptor Ditch collects runoff from the southern side of industrial area and diverts it to Pond C 2 Pond C 2 water is not discharged to Woman Creek, but is pumped to the Broomfield Diversion Ditch (around Great Western Reservoir) approximately semi annually (DOE 1994b)

The morphology of both Ponds C 1 and C 2 is related to sediment accumulations which have reduced their storage capacity (DOE 1993b) Pond C 1 had an estimated storage capacity at the spillway/outlet crest of approximately 6 1 acre feet at the time of construction By 1992 this spillway/outlet-crest storage capacity had decreased to approximately 5 2 acre feet, or a volume reduction of approximately 15 percent (EG&G 1992e) At the time of construction Pond C 2 had a principal spillway storage capacity of approximately 71 acre feet By 1992 this capacity had decreased to 70 acre feet, or a reduction of approximately 1 4 percent (Merrick Engineering 1992) The relatively small storage reduction from sedimentation in Pond C 2 appears reasonable because the pond is off-channel and only 15 years old.

It is anticipated that these alterations to pond morphology will continue into the future especially if additional development takes place onsite or in the upper Woman Creek drainage basin (Appendix A) Minor impacts on pond morphology (primarily affecting Pond C 1 but perhaps also Pond C 2 during larger storms) also could occur if development takes place in the Coal Creek basin and irrigation water continues to discharge into Woman Creek from the Kinnear and Smart 2 Ditches This would mean that additional sediment might enter either of these ponds Water/sediment interactions occur as precipitation and runoff erode surface soils as the water flows in open channels streams and within ponds (Appendix A)

The Woman Creek drainage basin has several artificial water controls including the SID which intercepts runoff and routes this runoff to Pond C 2 This runoff would normally flow into Woman Creek or would percolate into the underlying subsurface materials of the basin Ponds C 1 and C 2 themselves are artificial water control structures that temporarily store water and in the case of Pond C 2 may export water from the Woman Creek basin to the Walnut Creek basin The Woman Creek diversion dam routes all Woman Creek flows less than about the 100 year flood peak around Pond C 2 Irrigation inputs to

Woman Creek from the Kinnear Ditch and Smart 2 Ditch are artificial water controls that divert water from the Coal Creek basin into the Woman Creek basin (ASI 1990) The French drain on the 881 Hillside also may be classified as an artificial water control structure that changes the groundwater flow from the 881 Hillside to Woman Creek (Appendix A)

Stream reach gain/loss studies along Woman Creek, Mower Ditch and selected tributaries have been done by Colorado State University (Fedors and Warner 1993) and interim study results were discussed in Section 4 1 of TM1 (DOE 1993b) In addition EG&G has continued the gain/loss measurements since December 1991 In March 1993 36 well points were installed along Woman Creek, as described in TM1 (DOE 1993b) These well points were installed to assess which reaches of Woman Creek are gaining water (flowing from the shallow groundwater system into Woman Creek) and which reaches of Woman Creek are losing water (flowing from Woman Creek into the shallow groundwater system) Locations of these well points are shown on Figure 3 3

For the well point/stream water surface elevation monitoring a reach was assumed to be gaining if the upstream and downstream difference between the average groundwater elevation and surface water elevation was positive (that is flow was from the shallow groundwater system into Woman Creek) Conversely a reach was assumed to be losing if the upstream and downstream difference between the average groundwater elevation and surface water elevation was negative (flow was from Woman Creek into the shallow groundwater system) For the stream gain/loss study a reach was assumed to be gaining if the difference between the downstream flow and the upstream flow was positive Reaches were considered to be losing if the downstream flow and upstream flow difference was negative

In general four reaches of Woman Creek and its tributaries can be identified as generally gaining water from the shallow groundwater system on nearly a year round basis These include reaches 7 6 and 6-5 on the southwestern tributary flowing into Woman Creek, and reaches 9 10 and 18 19 on Woman Creek (Figure 3 3) (Appendix A) Gaining reach 9 10 is adjacent to IHSS 115 (Figure 3 3) however this gain is more likely due to inflows from the south bank (i e the opposite bank from the Original Landfill location) due to seepage input from an old orchard area (Appendix A) (Reach 18 19 lies downgradient from the Old Firing Range )

Other reaches downstream from Pond C 1 (reach C1 18) and both upstream and downstream from Pond C 2 (reach 20 24) have been identified based upon existing data, as losing year round (Appendix A) It is uncertain why the reach downstream from Pond C 1 is losing year round The reach in the vicinity of Pond C 2 most likely loses year round because it is a man made channel that is part of the Woman Creek diversion around Pond C 2

The other Woman Creek reaches range from gaining during the winter and spring months and losing during the rest of the year (reaches 1 2 2 3 3-4 4+5 8 8 9 11 12 17 C1 and 19 20 (Figure 3 3) to gaining for two months or less and losing the rest of the year (reaches 10 11 12+13 16 16 17 (Figure 3 3) The gain/loss data is based upon historical data collected by Fedors and others 1993 The data presented herein generally support the conclusions of Fedors and others 1993 as supported by additional EG&G gain/loss data on Woman Creek (Appendix A)

## 3 6 GEOLOGY AND HYDROGEOLOGY

A comprehensive geologic and hydrogeologic framework for the Site is presented in the Geologic Characterization Report for the Site (EG&G 1995a) and the Hydrogeologic Characterization Report (EG&G 1995b) The Section 3 6 1 summarizes the geologic history setting and deposits Section 3 6 2 presents a discussion of the inferred faults within the OU 5 area. Section 3 6 3 summarizes the OU 5 hydrogeologic setting

### 3 6 1 Geologic History Setting and Deposits

During the late Cretaceous period sediments east of the Front Range underwent initial orogenic uplift As the Cretaceous sea gradually regressed from the west to the east the Fox Hills beach front sands the Laramie delta plain deposits and the Arapahoe fluvial deposits prograded eastward over the Pierre Shale prodelta muds This marine regression was occasionally interrupted by small scale marine transgressions which may have been caused by variations in the rate of uplift along the Front Range During transgressive pulses thin intervals of Pierre Shale prodelta muds were deposited above the Fox Hills Sandstone As a result the Fox Hills Sandstone intertongues with the underlying Pierre Shale (DOE 1991) During the Pleistocene age the Rocky Flats Alluvium was deposited as an alluvial fan at the base of Coal Creek Canyon Holocene age uplift has dissected the Rocky Flats Alluvium and deposited the unconsolidated terrace and valley fill sediments along the drainages Geologic units observed in OU 5 are the Laramie Formation the Arapahoe Formation Rocky Flats Alluvium valley fill alluvium colluvium land slıde and artıficıal fill or man made deposıts Pıney Creek Alluvıum and valley fill alluvıum are one ın the same as presented hereın The followıng paragraphs summarıze the characterıstıcs of each of the geologıc unıts present ın the OU 5 area.

The bedrock that ıs present ın the OU 5 area ıs predomınantly the Laramıe Formatıon (Fıgure 3 4) Fıgure 3 5 shows the most recent ınterpretatıon of the bedrock elevatıon ın the OU 5 area. The Upper Cretaceous aged Laramıe Formatıon ıs approxımately 600 to 800 feet thıck It has been ınformally subdıvıded ınto lower and upper members The Upper Laramıe Formatıon ıs generally dıstınguıshed from the Lower Laramıe Formatıon where the Upper Laramıe Formatıon becomes domınantly composed of fine graıned sedımentary rocks (prımarıly claystone wıth no thıck sandstone beds) The upper part of the Laramıe Formatıon ıs approxımately 300 to 500 feet thıck and consısts prımarıly of olıve gray and yellowısh orange claystones wıth large ıronstone nodules A few thın coal beds occur ın the Upper Laramıe Formatıon but they are dıscontınuous Lentıcular beds of platey lamınated or frıable calcareous fine graıned lıght olıve gray sandstones are also present and occur wıth greater frequency at hıgher levels ın the sectıon

The Upper Cretaceous aged Arapahoe Formatıon lıes stratıgraphıcally above the Laramıe Formatıon was deposıted by a fluvıal system and ıs absent or as much as 50 feet thıck wıthın the vıcınıty of the Sıte (EG&G 1995a) The Arapahoe Formatıon ıs composed prımarıly of sandstones and claystones that are very sımılar to those ın the underlyıng Laramıe Formatıon Thıs sımılarıty between the upper Laramıe and Arapahoe Formatıons has resulted ın confusıon dıstınguıshıng these two unıts (EG&G 1992f and 1995a) Prevıous works (Van Horn 1957 and EG&G 1992f) have descrıbed the base of the Arapahoe Formatıon as a thıck dıscontınuous conglomerate wıth clasts composed prıncıpally of chert wıth some granıte gneıss and schıst As shown on Fıgure 3 4 only a small amount of Arapahoe Formatıon ıs present wıthın the OU 5 area, wıth most of ıt located ın the southeast portıon of the OU and very lıttle ın the area of IHSS 133 or IHSS 115

The sandstone unıts appear to be composed of channel poınt bar and overbank deposıts from meanderıng and braıded streams (Fıgure 3 7) It has been a poınt of controversy as to whether these sandstone unıts are part of the Laramıe Formatıon or part of the Arapahoe Formatıon Arapahoe Formatıon sandstones were prevıously classıfied as the No 1 through No 5 sandstones (DOE 1991) However the most recent study ındıcates that the No 1 Sandstone belongs to the Arapahoe Formatıon and Sandstones Nos 2 through 5 belong to the Laramıe Formatıon (EG&G 1995a) More data have been collected from the

No 1 Sandstone than any of the other sandstone intervals because of its shallow subsurface depth and its hydraulic connection with other units of the UHSU in the eastern portion of the industrialized area, underlying OU 2

In this report sandstones and siltstones encountered in drill core collected during the OU 5 investigation are classified as undifferentiated Laramie Formation/Arapahoe Formation due to the inability to differentiate between the Laramie Formation or Arapahoe Formations at the Site (Figure 3 8) According to Plate 5 9 of the Geologic Characterization Report (EG&G 1995a) the Arapahoe Formation No 1 sandstone or equivalent sandstones are interpreted to be present in OU 5 on the east side of IHSS 133 on the northeast side of IHSS 115 and in an area east of the Surface Disturbance South of the Ash Pits (Figure 3 7)

On the basis of the OU 5 investigation the bedrock encountered in the area of IHSS 115 and IHSS 133 are comprised predominantly of claystone with some thin interbeds and laminae of siltstone and sandstone (Appendix B) The claystone was observed to be massive to-thinly laminated containing trace ironstone nodules trace to some organics in the form of leaf imprints disseminated carbon and trace lignite interbeds with some thin interbeds and laminae of siltstone and sandstone Sandstone and siltstone interbeds from 0 5 to 10 feet in thickness (Figure 3 8) consisted of very fine to fine grained clayey to silty sandstones and sandy to clayey siltstones slightly friable to well cemented trace ironstone nodules cross bedded to laminated with some soft sediment deformation structures and trace fossils with trace to some disseminated carbon The environment of deposition appears to be a low energy fluvial environment

Unconsolidated material within OU 5 consists predominantly of landslide deposits and Rocky Flats Alluvium Lesser amounts of artificial fill including waste fill Piney Creek Alluvium colluvium, and terrace alluvium exist within the OU 5 boundaries (Figures 3 9 and 3 10) The overall thickness of the unconsolidated material throughout OU 5 ranges from about 2 to approximately 30 feet.

*Rocky Flats Alluvium* The Rocky Flats Alluvium was deposited by a system of coalescing alluvial fans aggraded by debris flows and braided streams along the base of the Front Range at the mouth of Coal Creek Canyon (EG&G 1995a) This unit forms a large (approximately 10 square miles) fan shaped deposit with bar and channel morphology on the Rocky Flats pediment Eastward flowing streams have dissected the pediment in several locations and have exposed Cretaceous age bedrock in some areas (EG&G 1995a)

According to the Preliminary Surficial Geologic Map of the Rocky Flats Plant and Vicinity (Shroba and Carrera, 1994) the Rocky Flats Alluvium commonly consists of beds and lenses of poorly sorted clast and matrix supported white to pink sandy cobbly gravel gravelly sand and silty sand Clasts are commonly subangular quartzite that were derived from Coal Creek Canyon Clasts of claystone and sandstone are locally present in the lower 20 inches of the unit. Generally the thickness of this unit is about three to 30 feet where pediment deposits overlie Upper Cretaceous aged bedrock, and about 30 to greater than 100 feet where these deposits overlie valley fill deposits (Shroba and Carrera 1994)

*Terrace alluvium* as described in the Geologic Characterization Report (EG&G 1995a) consists predominantly of a slightly cobbly gravelly light grayish brown to light reddish brown silty sand to clayey silt Clasts are mostly subangular quartzite The unit forms small terraces and terrace remnants about 8 to 33 feet above current stream levels that lack bar and channel morphology and are locally mantled by a thin layer of colluvium The terrace deposits within OU 5 are probably composed mostly of Broadway and Louviers Alluviums The thickness of these deposits ranges from about 10 to 20 feet.

*Pinev Creek Alluvium* The Piney Creek Alluvium and post Piney Creek Alluvium undifferentiated are commonly referred to as valley fill alluvium in this report These units consist of channel and terrace deposits in and along most of the ephemeral streams across the Site Areas in which Piney Creek Alluvium has been identified (Figure 3 10) consist of materials that are commonly slightly cobbly grayish brown silty sand to sandy clayey silt in the upper part and poorly sorted clast supported slightly cobbly gravel in a light yellowish brown clayey silty sand matrix in the lower part Clasts are mostly subangular quartzite with a minor amount of subrounded sandstone that was derived from older Quaternary aged deposits Thickness of this unit is about 3 to 15 feet with an average of about 10 feet (Shroba and Carrera, 1994) The Piney Creek Alluvium contains stage I (Gile and others 1966) carbonate veinlets and locally one or more buried soil A horizons about 2 to 3 inches thick and also may contain expansive clays The Piney Creek Alluvium forms low terraces approximately 3 to 6 feet above stream level that locally have poorly preserved bar and-channel morphology

*Colluvium* The colluvial deposits at the Site are middle Pleistocene to Recent in age and occur along Valley Slopes The colluvial material commonly consists of dark gray to light reddish brown silty sand sandy silt, clayey silt and silty clay that contain minor amounts of boulders and cobbles The unit locally includes clast and matrix supported boulders and cobbles to coarse to fine to cobbly gravel in a silty-clay matrix These materials are typically wellgraded to poorly graded and unstratified to poorly stratified Clasts are typically subangular to subrounded their sedimentologic composition reflects that of the bedrock and surficial deposits from which they were derived The thickness of these deposits is probably about 3 to 15 feet (Shroba and Carrera, 1994) The colluvium occurs as thin discontinuous deposits in the western portion of the Site and as more broad and laterally extensive deposits in the eastern portion of the Site (EG&G 1995a)

*Landslide Deposits* Landslide deposits include a wide variety of mass movement deposits resulting from the downslope transport of unconsolidated surficial and bedrock material along slip planes Landslide deposits are common along modern drainage slopes throughout the site and can occur as laterally extensive deposits (EG&G 1995a) (Figure 3 9) These deposits consist of materials that are commonly a dark gray to light reddish brown heterogeneous mixture of unsorted and unstratified surficial material and rock fragments in a wide range of sizes (including clasts that are of the same composition of the bedrock from which they were derived) Generally the thickness of these units is probably 10 to 30 feet (Shroba and Carrera, 1994)

*Artificial Fill* According to the Surficial Geologic Map of the Rocky Flats Environmental Technology Site and Vicinity (EG&G 1995a) the artificial fill consists of compacted and uncompacted fill material composed of varying amounts of sand and finer material heterogeneous cobbles and boulders and refuse Artificial fill which contains refuse will be referred to as waste fill herein The unit locally includes small areas of Rocky Flats Alluvium claystone and other unconsolidated deposits Generally the thickness of this unit is less than 10 feet however some of the earthen dams are greater than 30 feet thick.

### 3 6 2 Inferred Faulting

Inferred bedrock structures within the OU 5 area predominantly consists of three faults These inferred faults trend north northeast and are assumed to be high angle reverse faults in conformance with the regional structural framework (Figure 3 11) (EG&G 1995a) The dip of the fault planes is not known

The longest inferred fault, referred to as Fault 2 in the Geologic Characterization Report (EG&G 1995a) is northeast trending reverse fault that extends from Woman Creek to Colorado Highway 128 across the western part of the industrial area and the Landfill Pond (Figure 3 1) It is assumed that the fault plane dips to the west This fault was confirmed during the past year by a series of boreholes drilled to the north of the Landfill Pond as part of the Systematic Evaluation Program (SEP) (EG&G 1995d) and by boreholes drilled in OU 5 This data provided the best control for both the location and displacement of the fault Displacement of the A claystone was determined to be about 60 feet at both locations

Fault 4 as referred to in the Geologic Characterization Report (EG&G 1995a) is an inferred northeast trending fault that extends from Woman Creek to South Walnut Creek across OU 2 and into OU 5 (Figure 3 11) It is assumed that the Fault 4 is a reverse fault that dips to the northwest. Displacement in the A claystone has been observed to be approximately 70 feet within OU 2 (EG&G 1995a) The location of this fault is similar to that of the OU 2 bedrock step which was identified using shallow seismic reflection and borehole data (EG&G 1995a)

Inferred Fault 5 as referred to in the Geologic Characterization Report (EG&G 1995a) also extends through OU 5 and is located along the southeastern edge of the Industrial Area (Figure 3 11) Displacement of the A claystone across this fault is estimated to be approximately 30 feet (EG&G 1995a)

Evaluation of geologic and topographic features indicates a lack of recent movement along faults at the Site This lack of movement was recently confirmed in the Systematic Evaluation Program (SEP) trench where extensive fracturing was exposed in the bedrock across Fault 2 but was not present in the alluvium and did not offset the unconformity between the Laramie Formation and the overlying Rocky Flats Alluvium (EG&G 1995a and 1995d) The fault is reported as not capable according to Nuclear Regulatory Commission guidelines and therefore does not pose a seismic risk for the site (EG&G 1995d)

### 3 6 3 Hydrogeology

The regional hydrogeology and OU 5 hydrogeology are summarized in the following sections

### 3 6 3 1 Regional Hydrogeology

The Denver Groundwater Basin underlies a 6 700 square mile area in Colorado extending from the Front Range on the west to near Limon on the east and from Greeley on the north to Colorado Springs on the south The center ot the basin is located south of Bennett Colorado in western Arapahoe and Elbert Counties Alluvial aquifers 20 to 100 feet in thickness commonly occur in the valleys of large streams in the basin

The four major bedrock aquifers occurring in the Denver Basin from deepest to shallowest are the Laramie Fox Hills Aquifer the Arapahoe Aquifer the Denver Aquifer and the Dawson Aquifer The Pierre Shale underlies these units and due to its great thickness (up to 8 000 feet) and low permeability (Robson et al 1981a and 1981b) is considered to be the base of the four bedrock aquifers listed above Descriptions of the Denver Basin bedrock aquifers that exist beneath the Site the Laramie Fox Hills Aquifer and the Arapahoe Aquifer are presented below The Denver and Dawson Aquifers do not underlie the Site

*Laramie Fox Hills Aquifer* The Laramie Fox Hills Aquifer is composed of the sandstone and siltstone units of the Fox Hills Formation and the lower sandstone units of the Laramie Formation (Figure 3 3) The thickness of the aquifer ranges from 200 to 300 feet near the center of the Denver Basin (Robson et al 1981b) The Site is located near the western boundary of the aquifer The base of the aquifer dips steeply to the east in the area west of the Site and then 2 to 3 degrees to the east beneath the site The upper Laramie Formation which separates the unconsolidated water bearing Upper Hydrostratigraphic Unit (UHSU) in OU 5 (Section 3 6 3 2) from the underlying Laramie Fox Hills Aquifer consists of several hundred feet of claystones siltstones and some clayey or silty sandstones with occasional coal layers (EG&G 1995a and b)

In outcrop and shallow subcrop areas recharge to the Laramie Fox Hills Aquifer occurs as infiltration of incident precipitation and as infiltration of groundwater from shallow alluvial aquifers respectively Outcrops of the Laramie and Fox Hills Formations in clay pits west of the Site are believed to be recharge areas for the aquifer (Rockwell 1987) Toward the interior of the basin downward leakage may also occur through the upper Laramie Formation from the overlying Arapahoe Aquifer (Robson et al 198lb) Recharge to the Laramie Fox Hills Aquifer from vertical leakage through the upper Laramie Formation is expected to be minimal at the Site due to the substantial thickness of claystones and siltstones of the upper Laramie Formation

On a regional scale groundwater in the Laramie Fox Hills Aquifer flows from outcrop recharge areas toward the center of the basin In the vicinity of the Site groundwater flow is generally from west to east (Hurr 1976)

*Arapahoe Aquifer* In the central part of the Denver groundwater basin the Arapahoe Formation consists of a 400 to 700 foot thick sequence of interbedded claystones siltstones sandstones and conglomerates with claystones and shale being more prominent in the northern third of the basin (Robson et al 1981a) Individual sandstone beds are commonly lenticular and range from a few inches to 30 to 40 feet in thickness (Robson et al 1981a) Beneath the Site the majority of groundwater flow in the Arapahoe Formation occurs in the lenticular sandstones within the claystones The portion of Arapahoe Aquifer present beneath the Site at OU 5 is not significant from a regional aquifer perspective because it is truncated by drainages on the Site and does not extend laterally from the Site to offsite areas

Recharge to the Arapahoe Aquifer occurs by the same mechanisms described for the Laramie Fox Hills Aquifer In outcrop and subcrop areas recharge occurs from infiltration of incident precipitation and as infiltration of groundwater from shallow alluvial aquifers respectively At the Site the Arapahoe Formation sandstones are recharged from infiltration of groundwater from overlying unconsolidated surface deposits On a regional scale the primary recharge mechanism for the Arapahoe Aquifer occurs through leakage from the overlying Denver Aquifer (Robson et al 1981a)

Groundwater in the Arapahoe Aquifer flows from recharge areas at the edge of the basin toward discharge areas along incised stream valleys Groundwater also discharges from pumping wells (Robson et al 1981a)

### 3 6 3 2 OU 5 Hydrogeology

Saturated unconsolidated surface deposits and weathered bedrock units of the Arapahoe and/or upper Laramie Formations (Figures 3 4 3 9 and 3 10) are considered the UHSU The UHSU is the hydrogeologic unit of concern at the Site because of the potential for contamination and contaminant migration The vast majority of site impact has occurred in the UHSU The unweathered undifferentiated Arapahoe Formation and Laramie Formation are considered the LHSU at the Site Contaminant concentrations in the unweathered upper Laramie Formation at the Site are typically very low and the Laramie Fox Hills Aquifer exists at a substantial depth below the Site with a substantial thickness of unweathered intervening claystones and siltstones separating it from the shallow UHSU (EG&G 1995b) Therefore the Laramie Formation and the Laramie Fox Hills Aquifer are not addressed in the context of OU 5 hydrogeology because the potential for contamination of these units from site related activities appears to be minimal

Hydrogeologic conditions in the shallow surface units at OU 5 are influenced by local conditions local recharge and interactions with the SID the 881 Hillside French Drain and Woman Creek The earthen dams of Ponds C 1 and C 2 also influence groundwater flow The SID and Ponds C 1 and C 2 were constructed to contain surface water The French Drain was constructed south of OU 1 to intercept groundwater flow

In general groundwater in the shallow unconsolidated geologic units of OU 5 flows from topographically higher pediment areas (recharge) toward the drainages (creeks) (discharge) that divide the pediment areas Groundwater is then transmitted into and through the valley fill alluvium that underlies the creeks ultimately discharging to the creeks The shape of the top of bedrock surface strongly influences groundwater flow by concentrating flow within erosional lows on the bedrock surface Groundwater recharge to the shallow unconsolidated units occurs primarily as a result of local infiltration of snowmelt, rainfall and surface water within the OU 5 area. Groundwater recharge also occurs as inflow to OU 5 from upgradient areas to the west and from the industrial area to the north Artificial sources of recharge from the industrial area occurs from building footing drains storm drains and storm surface water diversion ditches Standing surface water with marsh type vegetation observed along the SID suggests that the SID captures surface and groundwater and locally affects the recharge to the groundwater system. Antelope Springs located on the southwest corner of OU 5 receives recharge from Rocky Flats Lake (Figure 3 1)

*Upper Hydrostratigraphic Unit* The shallow saturated hydrogeologic units at OU 5 comprise the UHSU which consists of unconsolidated surface deposits (Rocky Flats Alluvium valley fill alluvium landslide artificial fill and colluvium) and weathered bedrock (claystone sandstone siltstone) of the Arapahoe/Laramie Formations that are in hydraulic communication with the saturated surface materials

The Arapahoe/Laramie Formation sandstones where they appear to be in hydraulic communication with saturated surface materials are also considered to be part of the UHSU The UHSU within OU 5 is believed to exist predominantly under unconfined conditions however partially confining conditions may exist in the bedrock sandstones that are part of the UHSU

Groundwater in the UHSU flows generally eastward with secondary flow patterns along slopes toward drainages Groundwater flow in OU 5 is strongly affected by the topographic relief the thin relatively permeable surficial deposits and the underlying impermeable claystone bedrock surface topography Sitewide the geometric means of the hydraulic conductivities are 2 54E-03 centimeters per second (cm/sec) for the valley fill alluvium 2 1E 04 cm/sec for the Rocky Flats Alluvium and 9 33E-05 cm/sec for the colluvium 3 89E 05 cm/sec for the weathered sandstone 2 88E 05 cm/sec for the weathered siltstone and 8 82E 07 cm/sec for the weathered claystone (EG&G 1995b) The colluvium and landslide deposits are similar in textural and hydraulic properties (Schroba and Carrera, 1994) Hydraulic characteristics of the artificial fill vary depending on the purpose of the fill Generally the fill ranges from low hydraulic conductivity such as the Pond C 2 dam to relatively high hydraulic conductivity associated with waste fill materials Many areas of artificial fill are superficial (road base) and the base of the fill is above the water table

Groundwater elevations in the UHSU vary seasonally with the highest elevations recorded during the late winter spring time period and the lowest elevations recorded during the late summer fall time period Seasonal variations in groundwater elevations ranged from less than 1 foot to over 6 feet The OU 5 area exhibits localized flow from seeps and springs on the slopes of the Woman Creek drainage (EG&G 1995b) Some of the groundwater emerging at seeps and springs is lost to evaporation however some flows along the surface and discharges into Woman Creek Woman Creek is both a gaining and a losing stream In the western half of the drainage Woman Creek is generally gaining whereas in the eastern half it is generally losing The extent of gaining and losing reaches varies seasonally (Fedors and Warner 1993) as described previously in Section 3 5

Groundwater level data used for the evaluation of the UHSU were collected from historical and Phase I monitoring wells within the OU 5 area. These data were obtained from RFEDS and are presented in detail in Section 5 8 for the individual IHSSs Groundwater level data were used to create UHSU groundwater hydrographs (Section 5 8) and the UHSU potentiometric maps (Section 5 7 Figures 3 24 3 25 3 35 and 3 36) The potentiometric surface maps were prepared using all available groundwater elevation data.

Physıcal parameter data, used for the evaluatıon of the hydraulıc propertıes of the UHSU (Appendıces A and C were obtaıned from aquıfer test results [Appendıx D]) Descrıptıons of alluvıal and bedrock materıals were obtaıned from lıthologıc logs (Appendıx B)

*Lower Hydrostratıgraphıc Unıt* The LHSU underlıes the UHSU and ıs composed of unweathered upper Laramıe Formatıon or Arapahoe Formatıon clayey to sılty sandstones claystones and clayey to sandy sıltstones Unweathered bedrock sandstone sıltstone and claystone geometrıc mean hydraulıc conductıvıtıes are 5 77E 07 cm/sec 1 59E-07 cm/sec and 2 48E 07 cm/sec respectıvely (EG&G 1995b) The relatıvely low hydraulıc conductıvıty of the unweathered bedrock suggests that the unweathered bedrock acts as a barrıer to downward groundwater flow and effectıvely mınımızes groundwater ınteractıon between unıts above and below the base of weatherıng Hydrograph data ındıcate unweathered bedrock and UHSU deposıts are not hydraulıcally connected (EG&G 1995b) Sıx bedrock wells were ınstalled as part of the scope of TM15 to evaluate possıble hydraulıc ınteractıon between the UHSU and the LHSU ın OU 5 specıfically ın and around the Orıgınal Landfill (IHSS 115/196) Because of the lack of hydraulıc connectıon between the UHSU and the LHSU the vast majorıty of contamınatıon occurs ın the UHSU A dıscussıon of the LHSU ın the area of the Orıgınal Landfill ıs presented ın Sectıon 3 8 1

## 3 7 ECOLOGY

### 3 7 1 Terrestrial Ecosystems

The Sıte ıs located just below the elevatıon at whıch plaıns grasslands grade abruptly ınto lower montane (foothılls) forests (Marr 1964) The vegetatıon of the Sıte and adjacent areas ıs domınated by mıxed grass praırıe ınterspersed wıth varıous upland and lowland communıty types

Wıldlıfe communıtıes at the Sıte have been greatly ınfluenced by the ıncrease ın human use and dısturbance over the past 100 years Most notable has been the reductıon ın the number and dıversıty of ungulates and predators The relatıve ısolatıon and habıtat dıversıty of the Sıte have resulted ın a rıch anımal communıty when compared to nearby rangeland cropland and commercıal or ındustrıal development The absence of domestıc lıvestock and the proxımıty to large areas of open space have contrıbuted sıgnıficantly to the ecologıcal resources at the Sıte

More ınformatıon on ecologıcal receptors and potentıal ecologıcal rısk ın OU 5 can be found ın the ecologıcal rısk assessment for the Woman Creek watershed presented ın Sectıon 7 0

### 3 7 1 1 Vegetatıon

Plant communıtıes wıthın OU 5 are ınfluenced prımarıly by moısture and prıor dısturbance Topographıc posıtıon ıs the major factor ınfluencıng soıl moısture Areas along Woman Creek are persıstently moıst (mesıc) because of subsurface flows wıthın the valley floor alluvıum ın addıtıon to runoff and ınterflow from adjacent hıllsıdes The stream channel ıs wet (hydrıc) for much of the year although duratıon of surface flow ıs varıable North facıng slopes wıthın the draınage are relatıvely mesıc because of the low angle of ınsolatıon and the retentıon of snow South facıng slopes and rıdgetops are not as dry (xerıc) as mıght be expected probably because of shallow subsurface flow through the Rocky Flats Alluvıum that caps the draınage dıvıdes

A complete lıst of plant specıes documented at the Sıte ıs supplıed ın Appendıx B of the *Baselıne Bıologıcal Characterızatıon of Terrestrıal and Aquatıc Habıtats at the Rocky Flats Plant* (DOE 1992c)

Mesıc mıxed grassland ıs the predomınant habıtat type assocıated wıth OU 5 occurrıng both as large communıtıes and small ınclusıons ın other habıtats It domınates the north facıng and south facıng hıllsıdes along the upper reaches of Woman Creek and the broad valley floor south and east of the OU 5 IHSSs (Fıgure 3 12) Thıs habıtat tends to be domınated by sod formıng (rhızomatous) grasses Western wheatgrass *(Agropyron smıthıı)* ıs typıcally the domınant specıes Other prevalent gramınoıds ınclude blue grama *(Bouteloua gracılıs)* sıde oats grama *(Bouteloua curtıpendula)* praırıe junegrass *(Koelerıa pyramıdata)* bıg bluestem *(Adropogon gerardıı)* lıttle bluestem *(A scoparıum)* Canada bluegrass *(Poa compressa)* Kentucky bluegrass *(Poa pratensıs)* needle and thread *(Stıpa comata)* green needlegrass *(Stıpa vırıdula)* sleepygrass *(Stıpa robusta)* swıtchgrass *(Panıcum vırgatum)* and narrowleaf sedge *(Carex stenophylla)* Frınged sagebrush *(Artemısıa frıgıda)* praırıe sage *(A ludovıcıana)* and broom snakeweed *(Gutıerrızıa sarothrae)* are common throughout thıs habıtat Nonnatıve specıes such as knapweed *(Centaurea dıffusa)* cheatgrass *(Bromus tectorum)* smooth brome *(Bromus ınermıs)* and Russıan thıstle *(Salsola ıberıca)* also exıst The prevalence of taller and more sod formıng grasses a generally hıgher dıversıty of natıve forbs and an ıncreased abundance of low shrubs or subshrubs ınfluences the use by small bırds and mammals

Xeric mixed grassland occupies the broad uplands both north of the OU 5 IHSSs and south of Woman Creek (Figure 3 12) This habitat is relatively dry as a result of greater exposure to sun and wind and well drained soils but persistent moisture is available at relatively shallow depths in the Rocky Flats Alluvium capping the ridges As a result some mesophytic species such as big bluestem and little bluestem are present Prevalent native species include prairie junegrass red three awn *(Aristida purpurea)* and mountain muhly *(Muhlenbergia montana)* with varying amounts of blue grama side-oats grama, and sand dropseed *(Sporobolus cryptandrus)* Other common species include needle and thread Canada bluegrass bottlebrush squirreltail *(Sitanion hystrix)* and narrowleaf sedge Yucca and cacti are locally common in areas of shallow soil

Annual grass/forb habitat is located in the surface disturbance south east of Pond C 1 and is dominated by weedy species (Figure 3 12) Prevalent species are usually aggressive nonnative annual or biennial plants Weedy mustards weedy composites field bindweed *(Convolvulus arvensis)* and great mullein *(Verbascum thapsus)* dominate these areas along with cheatgrass and Japanese brome *(Bromus japonicus)* Cover height and seed production may support some wildlife use but relatively low diversity extreme seasonality and short lived productivity are limiting factors

Reclaimed grassland generally occurs as distinct plantings north of Woman Creek up to and including patches in the industrial area of the Site (Figure 3 12) This habitat consists of introduced range or pasture grasses particularly smooth brome *(Bromopsis inermis)* and intermediate wheatgrass *(Agropyron intermedium)* with minor amounts of crested wheatgrass *(A cristatum)* Many of the stands are nearly a monoculture of the planted species The low plant diversity and structure of these coarse grasses are important limiting factors on wildlife use

Riparian woodland habitats are associated with the hydric soils located along a narrow corridor on either side of Woman Creek and along the margins of Ponds C 1 and C 2 (Figure 3 12) This habitat consists of mature plains cottonwoods *(Populus deltoides)* and peachleaf willows *(Salix amygdaloides)* occurring either as small clumps or individual trees along the drainages ponds and seeps Associated species often include those listed below for riparian shrubland as well as wild rose *(Rosa* spp *)* golden currant *(Ribes aureum)* snowberry *(Symphoricarpos* spp *)* and a variety of grasses and forbs The presence of large trees and seasonal availability of surface water attract wildlife not otherwise associated with the prairie ecosystems that dominate the Site

Riparian shrubland also occurs along the Woman Creek corridor often in association with riparian woodland Dominant species include coyote willows *(Salix exigua)* peachleaf willows and leadplant *(Amorpha fruticosa)* The shrubby species that dominate this habitat support use by some wetland or riparian wildlife species but diversity and density are typically lower

Short marsh habitats occur along Woman Creek and the SID and in groundwater seep areas to the south It requires seasonally wet (saturated) sites such as hillside seeps (Figure 3 13) They are dominated by sedges rushes and hydrophytic forbs Low plant height, low plant species diversity dense cover and wet soil limit the variety of wildlife using this habitat type

Ponderosa pine woodland occurs as sparse stands on rocky uplands such as those found in the surface disturbance located south of the south fork of Woman Creek (Figure 3 12) The understory beneath the open pine canopy is typically dominated by native species characteristic of the foothills a few miles west of the Site Shrubs in the understory include wax currant *(Ribes cereum)* skunkbrush *(Rhus trilobata)* and snowberry Ponderosa pine *(Pinus ponderosa)* attract wildlife not otherwise present in prairie ecosystems including a number of species that are eastward extensions of the nearby foothills fauna

Disturbed communities and/or barren lands occur as small inclusions of other habitat types usually associated with IHSSs Some IHSSs such as the old landfill are essentially devoid of vegetation Most of the disturbed land has been invaded by annual weeds such as tumble mustard *(Sisymbrium altissimum)* tansy mustard *(Descurainia pinnata)* alyssum *(Alyssum minus)* prickly lettuce *(Lactuca serriola)* diffuse knapweed *(Centaria diffusa)* Russian thistle *(Salsola iberica)* kochia *(Kochia scoparia)* and bracted vervain *(Verbena bracteata)* The lack of cover and food limit wildlife use of this habitat

### 3 7 1 2 Wildlife

*Large Mammals* Wildlife species within OU 5 are typical of the Site and similar habitats throughout the Front Range foothills This semblance is due to a lack of barriers within the Site and between the western plains and the surrounding foothills Larger mammals observed within OU 5 include the coyote *(Canis latrans)* and mule deer *(Odocoileus hemionus)* Both of these species are wide ranging and the mosaic of habitats within OU 5 is suitable for their use Raccoons *(Procyon lotor)* long tailed weasels *(Mustela* *frenata)* striped skunks *(Mephitis mephitis)* and red foxes *(Vulpes vulpes)* also occur at the Site in habitats such as those in OU 5

*Small Mammals* The most common and widespread small mammal within OU 5 is the deer mouse *(Peromyscus maniculatus)* which has been captured in nearly every habitat type Additional small mammal captures include the meadow vole *(Microtus pennsylvanicus)* prairie vole *(M ochrogaster)* plains harvest mouse *(Reithrodontomys montanus)* western harvest mouse *(R megalotus)* and hispid pocket mouse *(Chaetodipus hispidus)* Less widely distributed species include the silky pocket mouse *(Perognathus flavus)* plains pocket mouse *(P flavescens)* olive backed pocket mouse *(P fasciatus)* and meadow jumping mouse *(Zapus hudsonius)*

The meadow jumping mouse is of special interest because the subspecies that occurs at the Site Preble s meadow jumping mouse *(Z h preblei)* is a candidate for federal listing as threatened or endangered (Figure 3 14) Preble s meadow jumping mouse has been captured at OU 5 and a significant amount of suitable habitat occurs there (Figure 3 14) Animals were captured in riparian areas with well-developed shrub canopies and a relatively lush understory of grasses and forbs This is typical of habitats occupied by the subspecies throughout its range Quantitative descriptions of small mammal distribution and abundance can be found in the Ecological Monitoring Program 1995 Annual Report (EG&G 1995f pending clearance)

*Birds* A variety of birds of prey occur at the Site The most common species are the red tailed hawk *(Buteo jamaicensis)* and great horned owl *(Bubo virginianus)* both of which are present on the site throughout the year and nest in mature cottonwoods or conifers such as those found in the Woman Creek valley Other species that breed onsite include the Swainson s hawk *(Buteo swainsonii)* American kestrel *(Falco sparverius)* and long-eared owl *(Asio otus)*

The C ponds constructed at the Site for control of surface water runoff support seasonal use by a number of wading birds shorebirds waterfowl and related species The largest water bird observed at the site is the great blue heron *(Ardea herodias)* which preys on fish amphibians and large macroinvertebrates Herons are prevalent at Pond C 2 because of its abundant fathead minnow population The smaller black crowned night heron *(Nycticorax nycticorax)* also feeds along the ponds although less commonly Neither of these species is known to nest in OU 5 although they use the site during the breeding season

The most common waterfowl on Ponds C 1 and C 2 are the Canada goose *(Branta canadensis)* mallard *(Anas platyrhynchos)* gadwall *(A strepera)* green winged teal *(A. crecca)* blue winged teal *(A discors)* and pied billed grebe *(Podilymbus podiceps)* All of the species listed above nest in wetland vegetation along the margins of the ponds

The most extensive small bird communities in OU 5 are dominated by ground nesting species typical of prairie ecosystems in the region Ridgetops and hillsides support species such as western meadowlark *(Sturnella neglecta)* vesper sparrow *(Pooecetes gramineus)* and grasshopper sparrow *(Ammodramus savannarum)* plus the horned lark *(Eremophila alpestris)* in more xeric habitats

The presence of mature deciduous trees along Woman Creek riparian corridors attract sarboreal (tree nesting) species such as the northern flicker *(Colaptes auratus)* eastern and western kingirds *(Tyrannus tyrannus* and *T verticalis)* black billed magpie *(Pica pica)* American robin *(Turdus migratorius)* warbling vireo *(Vireo gilvus)* yellow warbler *(Dendroica petechia)* northern oriole *(Icterus galbula)* blue grosbeak *(Guiraca cyanea)* and American and lesser goldfinches *(Carduelis tristis* and *C psaltria)*

Wetland shrubs and cattails support a songbird community dominated by the red winged blackbird *(Agelaius phoeniceus)* common yellowthroat *(Geothlypis trichas)* song sparrow *(Melospiza melodia)* and less commonly the yellow headed blackbird *(Xanthocephalus xanthocephalus)*

*Reptiles and Amphibians* As is typical for the region reptile and amphibian species are not as numerous as other invertebrates in OU 5 The most common species are the bullsnake *(Pituophis melanoleucus)* yellow bellied racer *(Coluber constrictor)* garter snakes *(Thamnophis* spp ) and prairie rattlesnake *(Crotalus viridis)* All of these species occur in the open grassland habitats that dominate OU 5 although the garter snakes are frequently found in or near water

By far the most abundant and widespread amphibian at the Site and within OU 5 is the boreal chorus frog *(Pseudacris triseriata)* This small wetland dwelling member of the tree frog family occurs in virtually every stream pond ditch or other area where surface water persists through the spring and early summer A true frog the northern leopard frog *(Rana pipiens)* is completely aquatic and requires permanent water such as is found in the C ponds

The Woodhouse s toad *(Bufo woodhousei)* breeds in ponds and streams at the site but may wander considerable distances from water in search of insect prey The plains spadefoot *(Scaphiopus bombifrons)* requires the least persistent water of any of the amphibians at the site like true toads such as the Woodhouse s toad spadefoots spend most of the year in the mud beneath seasonally wet sites

*Arthropods* Four classes of arthropods have been captured during sweep netting pitfall trapping or opportunistic netting of invertebrates within OU 5 the millipedes (Diplopoda) isopods or pill bugs (Crustacea) spiders and allies (Arachnida) and insects (Insecta) (DOE 1992c) Of these the insects were the most abundant and taxonomically diverse group

The arthropod community in OU 5 provides a prey base for insectivores Grasshoppers and leafhoppers are probably the most important prey groups because of their abundance size and tendency to occur on the foliage of plants where they are easily detected and captured Large grasshoppers are also consumed by predators such as kestrels and coyotes

### 3 7 2 Aquatic Ecosystems

Aquatic habitats within OU 5 are restricted to the head waters of Woman Creek and its tributaries Intermittent stream flow with areas of persistent flow typifies Woman Creek in OU 5 Intermittent segments contain isolated pools that provide important habitat for many aquatic species during the late summer and early fall when flow ceases Persistent flows originate from seeps and springs around SW104 a surface water sampling site south of the OU 5 area from Rocky Flats Lake an abandoned gravel pit southwest of the Site and dispersed groundwater seeps along Woman Creek Pond C1 is the only impoundment of Woman Creek on the Site as Pond C 2 receives flow from the SID

OU 5 IHSSs do not appear to impact Woman Creek s water quality Water quality throughout the upper reaches of Woman Creek is good and heterogeneous substrate in the stream channels provides habitat for species adaptable to variable flow (DOE 1992a, 1992c)

*Benthic Communities* The benthic macroinvertebrate community within Woman Creek is relatively rich and diverse (DOE 1992c) The most abundant and widespread groups overall in stream communities are the larvae of true flies (Diptera) and mayflies (Ephemeroptera) The most common dipteran taxa are blackflies (Simulidae) and midges (Chironomidae) Both caenid and baetid mayflies are also common Other aquatic invertebrates include caddisflies (Trichoptera) craneflies (Diptera Tipulidae) predatory damselfly larvae (Odonata) and two non insect taxa, the amphipod (sideswimmer) *(Hyalella azteca)* and the snail *(Physella* sp*)* Species richness for mayflies and caddisflies increases from headwater segments to SW026 (east of Pond C 2) where flow in Woman Creek decreases apparently due to loss to groundwater (DOE 1992c)

The OU 5 pond habitats provide a more reliable water source than the intermittent stream channels However as is typical of lentic (pond) water bodies the more homogenous substrate and lack of flow limits the macroinvertebrate communities Most of the communities are strongly dominated by midges and aquatic earthworms (Oligochaeta) Pond C 1 with a more developed aquatic plant community along the edges supports a more diverse assemblage of nektonic forms including water striders (Hemiptera Gerridae) and water boatmen (Hemiptera Corixidae) Predatory dragonfly nymphs (Odonata) are present in the C ponds as are crayfish (Astacidae)

*Fish* As with macroinvertebrates low and intermittent flow along most stream reaches within OU 5 greatly limits the ichthyofauna of the site Species captured in the streams include the creek chub *(Semotilus atromaculatus)* stoneroller *(Campostoma anomalum)* fathead minnow *(Pimephales promelas)* and green sunfish *(Lepomis cyanellus)* Of these species the creek chub is the most tolerant of poor water conditions McClane (1978) reported that within its range the creek chub may be found in almost any stream capable of supporting fish life

Fish communities in the C ponds are highly influenced by the presence of suitable substrates aquatic vegetation and persistence of water The most common species include the golden shiner *(Notemigonus crysoleucus)* white sucker *(Catostomus commersoni)* and largemouth bass *(Micropterus salmoides)* Golden shiners feed on a variety of small prey and algae and may themselves be important prey for larger fish or piscivorous birds because of the large populations they attain and their relatively large size White suckers are tolerant of large amounts of pollution siltation and turbidity and able to survive in waters low in oxygen (McClane 1978) This widespread species feeds on insect larvae and algae Largemouth bass caught in Pond C 1 include large individuals that undoubtedly are at the top of the aquatic food web aside from large terrestrial piscivores such as cormorants or great blue herons

### 3 7 3 Species and Habitats of Special Concern

Candidate endangered animal species of interest include the Preble s meadow jumping mouse and ferruginous hawk *(Buteo regalis)* Both have been documented at the Site during field investigations in 1991 and 1992 Specimens of Preble s meadow jumping mouse were collected in moist habitats along Woman Creek in both 1991 and 1992 (EG&G 1992g) Swainson s hawks nest at the Site and the tall cottonwoods along Woman Creek represent suitable nest sites Ferruginous hawks are present in the region primarily during the winter but an unmated juvenile male spent considerable time in the Woman Creek drainage during the summer of 1991

Only one endangered plant species the Ute (or Diluvium) ladies tresses orchid is potentially on or near the Site It has been observed on Boulder County open space 10 miles to the north and along Clear Creek to the south However it has not been observed during intensive field investigations in OU 5 and other reaches of Woman Creek in 1991 or during a sitewide endangered species survey in 1992 (EG&G 1992h)

## 3 8 PHYSICAL CHARACTERISTICS OF EACH IHSS

This section provides discussions of physical characteristics as they pertain specifically to the geology and hydrogeology of each IHSS within OU 5 The physical setting of each IHSS is also described within each of the following sections

### 3 8 1 IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)

This section discusses the geology hydrogeology and physical setting of IHSSs 115 and 196 Because IHSS 196 is located within the boundaries of IHSS 115 these IHSSs are discussed together

The Original Landfill (IHSS 115) and the Filter Backwash Pond (IHSS 196) are located within the south buffer zone just south of the Site industrial area (Figure 3 15) IHSS 115/196 are located north of Woman Creek on a moderately to steeply sloping south facing hillside (DOE 1994a, Appendix C Photos 39 40 and 42) The northern portion of the Original Landfill lies just south of the buffer zone access road and forms a flat bench that drops off to the south (DOE 1994a Appendix C Photo 14) In the western section of the Original Landfill (DOE 1994a, Appendix C Photo 47) an erosional swale exists The original landfill extends beneath the SID and the SID road and along the south sloping hillside down to Woman Creek Three seeps have been identified along the eastern edge of the surface disturbance east of the Original Landfill (Figure 3 15) A sewer outfall pipe daylights in the top central portion of the original landfill (DOE 1994a Appendix C Photos 51 and 54) Waste debris can be found along the surface of the original landfill and sticking out of sloped areas (DOE 1994a Appendix C Photos 19 20 44 52 and 53)

IHSS 196 lies near the bottom of the above mentioned swale north of the SID within IHSS 115 (Figure 3 15) IHSS 196 lies within a flat section of the swale and is surrounded by steeping sloping sidewalls to the north west and east Two seeps have also been identified in the area of and west of IHSS 196 (Figure 3 15)

The physical characteristics of the IHSS 115/196 area were based on information from the Phase I and TM15 field investigations (DOE 1992a and 1994a) the Geologic Characterization Report (EG&G 1995a) the Hydrogeologic Characterization Report (EG&G 1995b) and the Preliminary RFETS OU 5 Geotechnical Investigation (EG&G 1995e)

### 3 8 1 1 Geology IHSS 115/196

Geologic deposits present in IHSS 115/196 consist of unconsolidated artificial fill waste fill landslide colluvium valley fill alluvium (Piney Creek Alluvium) Rocky Flats Alluvium and consolidated bedrock of the undifferentiated Arapahoe/Laramie Formations and are discussed below Borehole and monitoring well locations are presented in Figures 2 4 and 3 16 The preliminary geotechnical map of the area shows the surficial geology and is presented in Figure 3 16 Geologic cross sections through the area are presented in Figures 3 17 through 3 20B Figure 3 21 presents the thickness of unconsolidated materials in IHSS 115/196 which range from 2 feet up to approximately 37 feet The thickest sections of unconsolidated material is apparently Rocky Flats Alluvium in the northwest (boring 59594) waste fill in the central (boring 58693) and artificial fill and landslide material in the southeast center (57094)of the Original Landfill

*Artificial Fill* Artificial fill was encountered along the eastern portion of IHSS 115 and consisted primarily of sandy gravely clay and lacked plant production waste The artificial fill was placed along the south side of the SID during its construction and consisted of excavated material and clean imported road base/fill

*Waste Fill* Waste fill encountered in IHSS 115/196 consisted predominantly of sandy clayey gravels and cobbles derived from the Rocky Flats Alluvium mixed with varying amounts and types of waste from previous production at the site Types of waste observed during this investigation included sheet metal wood broken glass glass bottles plastic rubber metal shavings ceramic shingles nails solid blocks of graphite fine graphite silt and sand concrete asphalt, and 55 gallon steel drums The consistency of the waste fill ranged from loose and unconsolidated to moderately dense and consolidated The thickest deposits of the waste fill ranged from 9 feet (boring 56994) 12 feet (59194) and 15 5 feet (boring 56893) in the central area of IHSS 115/196 to approximately 12 to 20 feet on the west side of IHSS 115 (Figure 3 17)

*Landslide* Landslide deposits were not differentiated from the other geologic deposits presented in Figure 3 16 because the other geologic units were incorporated into the landslides during the landsliding Figures 3 18 through 3 20B show a symbol for landslide deposits however this unit may contain material from several discrete units and possibly different landslide events A discussion of the landsliding in IHSS 115/196 is presented in Section 3 8 1 2

*Colluvium* Colluvium is exposed in small undisturbed areas south of the Rocky Flats pediment terrace (Figure 3 16) where the deposit was developed on the gently sloping bedrock surface Colluvium consisted primarily of sandy clayey gravel and cobbles and sandy clay In cross section the colluvium appears to mixed with and apparently mobilized into the landslide deposits The thickness of colluvium ranged from 1 foot up to 13 feet

*Valley Fill Alluvium/ Piney Creek Alluvium* Valley fill alluvium (Piney Creek Alluvium of Figure 3 9) was encountered along Woman Creek and consisted primarily of sandy to silty-clayey gravel with cobbles The maximum thickness of valley fill alluvium was 5 to 7 feet

*Rocky Flats Alluvium* Rocky Flats Alluvium was encountered on the north side of IHSS 115/196 and consisted primarily of gravelly sand with some clay to sandy clay and clayey sand with some to trace gravel In addition there was a paleo-stream channel encountered in boring 59594 where a medium to fine grained sand was observed from 32 feet to 37 45 feet immediately above the underlying bedrock Thickness of the Rocky Flats Alluvium ranged from approximately 15 feet (boring 56994 where 9 feet of overlying waste fill was observed) to 37 45 feet (boring 59594)

*Arapahoe/Laramie Formations* The undifferentiated Arapahoe/Laramie Formation in IHSS 115/196 consisted predominantly of claystone with some thin interbeds and laminae of siltstone and sandstone The claystone was observed to be massive to thinly laminated containing trace ironstone nodules trace to some organics in the form of leaf imprints disseminated carbon and trace lignite interbeds with some thin interbeds and laminae of siltstone and sandstone Sandstone and siltstone interbeds from 0 5 to 10 feet in thickness consisted of very fine to fine grained clayey to silty sandstones and sandy to clayey siltstones slightly friable to well cemented trace ironstone nodules cross bedded to laminated with some soft sediment deformation structures and trace fossils with trace to some disseminated carbon

As part of the groundwater investigation to evaluate possible hydraulic interaction between the UHSU and the LHSU and to evaluate the inferred Fault 2 (Figure 3 11) five bedrock boreholes (56694 57194 57594 59894 and 71194) were drilled in and around the IHSS 115/196 area (Figures 2 4 and 3 16) Monitoring wells were installed in the borehole and screened where potential water bearing sandstones or siltstones (Figure 3 8) were encountered on the basis of the geologic and geophysical logs (Appendix B) Boring 56694 was abandoned due to borehole collapse during well installation and boring/well 59394 was installed as an offset A sixth well (71494) was located on the basis of the upper siltstone interval observed at location 57194 The inferred Fault 2 apparently intersects the Old Landfill between locations 71194 and 57194 striking north northeast Vertical displacement of the A claystone along Fault 2 was estimated at 60 feet

As part of the geotechnical investigation of the Original Landfill (EG&G 1995e) the claystone bedrock presented in cross sections A A through D D (Figures 3 17 through 3 20b) was differentiated based on the degree of weathering Classifications are severely weathered claystone moderately weathered claystone and fresh claystone Severely weathered claystone ranged in thickness from 0 5 feet to 4 feet and is weathered to the extent that little to no original rock texture or structure are recognizable Moderately weathered claystone ranged in thickness from 2 feet to 23 feet and is highly weathered (showing some discernible bedding structure with heavy iron oxide staining of both the groundmass and fractures and/or bedding planes) to moderately weathered (easily discernible bedding structures with variable amounts of iron oxide staining) to slightly weathered (occasional iron oxide staining along fractures and bedding) Fresh unweathered bedrock is characterized by the absence of iron-oxide staining

### 3 8 1 2 Landsliding IHSS 115/196

As shown on Figure 3 16 several discrete landslides as well as general areas of land sliding within the IHSS 115/196 area were defined during the geotechnical investigation Other areas of land sliding may possibly exist within the study area, although these areas are not readily evident due to their lack of indicative surface morphology Such areas would involve slides that are obscured by fill and that are not apparent on pre landfill airphotos or that are very old with completely eroded surface features (EG&G 1995e)

Three types of slope failure were noted within the IHSS 115/196 area during this geotechnical study These failure types involve different geologic materials underlying the landfill slope and are presented below

The first type of slope failure involved waste fill land sliding on severely weathered claystone Evidence for this type of failure was encountered in borehole 57194 which was located approximately 20 feet downslope of the upper concave landslide scarp in the central portion of the upper landfill slope (Figure 3 21) (EG&G 1995e) Approximately 3 feet of waste fill on disturbed moderately weathered claystone overlies in place severely weathered claystone The contact of disturbed and in place claystone at 4 feet lies along a nearly horizontal (10 degree) slick slide surface The disturbed material from 3 2 to 4 feet may represent a block of claystone worked in with the waste during fill placement, or bedrock incorporated within the sliding fill (EG&G 1995e)

The second type of slope failure involved colluvium sliding on severely weathered claystone Evidence of this type of land sliding was found in borehole 71294 located within the recent slide mass at the southeast corner of the study area. The colluvium at this location appears to have failed on or with underlying severely weathered claystone (EG&G 1995e)

The third type of slope failure involved landsliding within moderately weathered claystone Direct evidence of this type of slope failure was found in boring 57694 and in deep bedrock monitoring well

57594 These boreholes were drılled ın the lower slope south of the SID ın the east portıon of IHSS 115 (Fıgure 3 21) (EG&G 1995e) At borehole 57694 (drılled ınto a relatıvely recent land slıde) 3 feet of colluvıum and 11 5 feet of underlyıng moderately to severely weathered claystone overlıe ın place severely weathered claystone at 14 5 feet At borehole 57594 a sımılar sequence wıth 6 feet of colluvıum and about 10 5 feet of claystone overlıes ın place moderately weathered claystone at a depth of 16 5 feet (EG&G 1995e) The landslıde encountered ın borehole 57694 ıs shown on sectıon C C

The occurrence of colluvıum or landslıde debrıs underlaın by moderately weathered claystone wıthout an ıntermedıate zone of severely weathered bedrock, presents ındırect evıdence of slıdıng wıthın the moderately weathered claystone Thıs relatıon was encountered ın several boreholes ıncludıng 59694 58693 57094 and possıbly 56994 (EG&G 1995e) The land slıdes as ınterpreted ın these boreholes located along the slope above the SID are shown ın sectıons A A and B B and Fıgure 3 21

Based on a 1951 aırphoto boreholes 59794 71194 58693 59294 and 59094 are located wıthın the lımıts of what appears to be a large landslıde (Fıgure 3 21) No apparent slıde debrıs was encountered ın borıngs 59794/71194 however the alluvıal bedrock contact ıs approxımately 14 feet deeper than the elevatıon of the contact observed ın borıngs 43392 and 59194 suggestıng some movement downslope at thıs locatıon has occurred At 58693 roughly 12 feet of wet colluvıum/slıde materıal underlıes approxımately 15 feet of waste fill and overlıes fresh claystone at about 27 feet Boreholes 59294 and 59094 are located on the lower slope south of the SID 59294 shows landslıde materıals that overlıe severely weathered claystone and 59094 shows sımılar landslıde debrıs overlyıng valley fill alluvıum along Woman Creek (EG&G 1995e)

The geologıc ınterpretatıon presented on Sectıon B B (Fıgure 3 18) suggests a thıck landslıde deposıt or complex of land slıdes through borehole 57094 Thıs ınterpretatıon ıs based on the appearance of colluvıum/slıde materıal ın the deeper portıon of the core from 57094 the low top of bedrock elevatıon the relatıvely thın moderately weathered zone underlyıng colluvıum/slıde and the base elevatıon of the nearby land slıde evıdenced ın core from borehole 57594 Along the upper portıon of Sectıon B B slıdıng at the locatıon of grouped boreholes 57194 58394 and 71494 (located between promınent scarps on the upper landfill slope) ınvolves waste fill slıppıng on weathered claystone The conceptual landslıde model presented on Sectıon B B shows waste fill below the lower scarp faılıng on the older slıde materıal encountered ın 57094 The actual depth of thıs upper waste fill slıde below the lowed scarp ıs uncertaın (EG&G 1995e)

No compelling evidence for deep seated sliding within the fresh claystone was encountered during the geotechnical investigation (EG&G 1995e)

### 3 8 1 3 Hydrogeology IHSS 115/196

The UHSU hydrogeology of the IHSS 115\196 area is characterized by the southerly slope toward Woman Creek man made drainages (the SID and building drains) and groundwater flow through the unconsolidated surface deposits (artificial fill waste fill landslide deposits colluvium, and valley fill alluvium) and the weathered bedrock of the Arapahoe/Laramie Formations) As described in Section 3 6 3 2 the LHSU consists of unweathered bedrock of the Arapahoe/Laramie Formations A total of sixty one wells or piezometers (well points using teflon tubing mini wells using 1 inch PVC pipe and monitoring wells using 2 inch PVC pipe) were installed in the IHSS 115/196 area as part of the OU 5 RFI/RI investigation The UHSU potentiometric surface for September 1994 and May 1995 are presented in Figures 3 24 and 3 25 which represent the lowest and highest water level elevations respectively recorded during the period August 1994 to July 1995 Only four UHSU wells were dry during the May 1995 water level monitoring event and these locations were south of the SID on bedrock topographic highs Well 62893 which was constructed in an area of a seep was observed to be flowing at the surface during May 1995

Groundwater generally flows from the upgradient Rocky Flats Alluvium through the laterally continuous and intertonguing unconsolidated surficial materials in a south southeasterly direction until reaching the apex of Woman Creek (Figures 3 17 to 3 19) Along Woman Creek the groundwater flow direction changes to an easterly direction parallel to surface water flow The average groundwater gradient is 0 13 foot/foot during September 1994 and 0 16 foot/foot during May 1995 Groundwater flow is downgradient along the contact between the overlying unconsolidated deposits and the low permeability claystone bedrock

Recharge of the IHSS 115/196 area is primarily from upgradient precipitation infiltration (ground surface and along the SID) and possibly from building drains Groundwater discharges to the surface in places of shallow bedrock as diffuse flow (seeps) and concentrated flow (springs) (Figures 3 15 and 3 16) Below the SID Woman Creek is a losing stream for most of the year except for the wettest months Seasonal variations in recharge strongly affect the UHSU potentiometric surface (Figures 3 24 and 3 25) Figures

3 22 and 3 23 present hydrographs of wells located in the IHSS 115/196 area. Note the cyclic nature of the hydrographs for wells 59493 and 59593 which were monitored over a two year period (Figure 3 22) Seasonal fluctuations of six feet were observed in the wells located in IHSS 196 (wells 59493 63893 63993 and 64093) and over nine feet in well 60593 southwest of IHSS 115/196

Hydraulic characteristics of the waste fill in IHSS 115/196 were estimated during aquifer tests performed in 1993 (DOE 1994a) Results of the test on Well 59493 revealed hydraulic conductivities ranged from 1 37E 03 to 1 73E 02 cm/sec Hydraulic conductivities in this range are indicative of permeable well sorted sands and gravels The log of 59493 indicates the waste fill is underlain by approximately 1 foot of colluvium which is underlain by fresh to moderately weathered claystone bedrock.

Hydraulic conductivities of the valley fill alluvium/Piney Creek Alluvium in IHSS 115/196 were estimated in well 7086 during aquifer test evaluations for the RFETS Hydrogeologic Characterization Report which ranged from 1 5E 04 to 6 8E 04 cm/sec (EG&G 1995b)

Hydraulic characteristics of the Rocky Flats Alluvium in IHSS 115/196 were estimated during aquifer tests performed in 1995 by the Aquifer Testing Program (EG&G 1995i) Hydraulic conductivities in well 56994 ranged from 1 0E 05 to 1 2E-06 cm/sec using the falling head and rising head methods respectively and well 59594 was estimated at 7 7E 03 cm/sec using both the rising and falling head methods

Hydraulic characteristics of the colluvium/landslide material in IHSS 115/196 were estimated during aquifer tests performed in 1995 by the Aquifer Testing Program (EG&G 1995i) Hydraulic conductivities in well 59694 were estimated at 6 8E 07 cm/sec using the rising head method

As described in Section 3 5 3 2 the LHSU consists of unweathered bedrock of the Arapahoe/Laramie Formations To evaluate the potential for hydraulic interaction between the UHSU and LHSU six bedrock monitoring wells were installed during the implementation of TM15 (DOE 1994a) One of the six monitoring wells (well 57594) displayed artesian conditions (a water level elevation higher than the top of the confined aquifer it is screened in) during May 1995 Well 57594 had a hydraulic head measured at 5940 5 feet above MSL and two adjacent UHSU wells with lower water table elevations wells 59993 and 57994 at 5937 feet and 5936 feet above MSL respectively Thus the vertical gradient in this area near Woman Creek is upward at 1 0 foot/foot

Of the six LHSU wells three developed sufficient groundwater to be sampled for water quality parameters (57594 59894 and 71494) the remaining three wells have developed very slowly and have not been fully developed or sampled (57194 59394 and 71194 Water level measurements from wells 57194 59394 and 71194 have not stabilized since installation which is consistent with the textural properties and low permeabilities of the LHSU Water level measurements in wells 57194 59394 59894 71194 and 71494 indicate downward vertical gradients reflecting areas of recharge

Hydraulic characteristics of the LHSU in IHSS 115/196 were estimated during aquifer tests performed in 1995 by the Aquifer Testing Program (EG&G 1995i) Hydraulic conductivities of the upward fining clayey sandstone to sandy claystone in well 57594 ranged from 1 1E 06 to 7 0E 07 cm/s Hydraulic conductivities of the sandy siltstone in well 59894 ranged from 2 5E 06 to 9 7E 07 Hydraulic conductivities of the siltstone in well 71494 ranged from 3 8E 06 to 6 2E-06 The hydraulic conductivities of the LHSU lithologies screened in IHSS 115/196 are comparable to the geometric means for unweathered bedrock sandstone siltstone and claystone (5 77E 07 cm/s 1 59E 07 cm/c and 2 48E 07 cm/s respectively [EG&G 1995b]) reported in Section 3 5 3 2

In summary on the basis of the contrasts in hydraulic conductivities observed in IHSS 115/196 the UHSU groundwater flow is along the contact between the fresh to moderately weathered bedrock and the overlying unconsolidated surficial materials Due to the downward vertical gradient created by the two to three orders of magnitude difference in hydraulic conductivities between waste fill/Rocky Flats Alluvium and the bedrock in IHSS 115/196 very little possibility exists for downwind migration of contaminants

### 3 8 2 IHSS 133 (Ash Pits Incinerator and Concrete Wash Pad)

This section discusses the geology hydrogeology and physical setting of IHSS 133 The IHSS incorporates four original ash pits and two new ash pits (TDEM land TDEM 2) that were used to dispose of incinerator ashes the former incinerator area and a concrete wash pad The concrete wash pad was used to wash out cement trucks that were being used to construct the Site facilities

The IHSS 133 area is located within the south buffer zone just southwest of the Site industrial area south of the west access road and north of Woman Creek (Figure 3 15) Six IHSSs one pit, and a disturbed area east of the IHSSs were identified Two additional ash pits (TDEM 1 and TDEM 2) were identified from aerial photographs results of the TDEM survey and the soil boring investigation IHSSs 133 1 through 133 4 (the four original ash pits) IHSS 133 6 (concrete wash and disposal area) and the two TDEM anomalies lie south of a steep south facing slope on a fairly flat lying surface that slopes gently toward Woman Creek (DOE 1994a, Appendix C Photos 31 and 32) Photographs 18 and 36 in TM15 Appendix C show IHSS 133 2 (an ash pit delineated by two signs shown at the right side of photo 18) located just below the above mentioned steep slope The terrain is hummocky (DOE 1994a, Appendix C Photos 31 and 32) and the individual ash pits can to some extent be identified as a hump on the ground surface IHSS 133 5 (shown on DOE 1994a, Appendix C Photo 17) occupies a portion of the above mentioned steep south facing slope and a portion of a flat bench above the sloped area IHSS 133 5 is the where the old incinerator was located and an area that was subsequently used for washing concrete trucks It was common practice for concrete trucks with unused partial loads of concrete to have their remaining loads poured and their interiors washed prior to being returned to their respective concrete plants

The overall area is predominantly covered with prairie grasses and cacti A dirt access road, an underground abandoned gasline and an overhead powerline pass east to west through the IHSS 133 area

The physical characteristics of the IHSS 133 area were based on information from the Phase I and TM15 field investigations (DOE 1992a and 1994a) the Geologic Characterization Report (EG&G 1995a) and the Hydrogeologic Characterization Report (EG&G 1995b)

#### 3 8 2 1 Geology IHSS 133

Geologic deposits present in IHSS 133 consist of unconsolidated artificial fill waste fill landslide colluvium valley fill alluvium (Piney Creek Alluvium) Rocky Flats Alluvium, and consolidated bedrock of the Arapahoe/Laramie Formations are discussed below The surficial geology and bedrock geologic map are presented in Figures 3 4 and 3 9 Borehole and monitoring well locations are presented in Figures 2 12 and 3 26 Geologic cross sections through the area are presented in Figures 3 27 through 3 32 Figure 3 33 presents the thickness of unconsolidated materials in IHSS 133 which range from 2 5 feet up to approximately 34 feet The thickest sections of unconsolidated material appears to be the Rocky Flats Alluvium along the north side (55493) of IHSS 133 5 and the colluvium/landslide material in the east side (57093) in IHSS 133 2 A moderately thick section of colluvium/landslide material is present along the west side of IHSS 133 4 The thick sections of unconsolidated material on the east side of IHSS 133 2 and west side of IHSS 133 4 may represent paleo-landslide deposits

*Artificial Fill* Artificial fill encountered along the west central portion of IHSS 133 consisted primarily of gravelly to clayey sand and clay concrete and lacks incinerated waste ash The artificial fill was placed in and around IHSS 133 5 the former incinerator area and IHSS 133 6 the concrete washout area (Figure 3 9) Artificial fill was also placed as thin lifts for daily cover during disposal of the incinerator ash

*Waste Fill* Waste fill encountered in IHSS 133 consisted predominantly of incinerated types of waste from previous production at the Site mixed with sandy silt Types of waste observed during this investigation included small pieces of rusted metal sand to silt size metal broken glass asbestos ceramic and nails The consistency of the waste fill was loose with some evidence of differential compaction which created void spaces above the ash and the overlying cover of artificial fill Waste fill from the incinerator was apparently placed into the ash pits in thin lifts which ranged in thickness from less than 0 5 foot up to approximately 3 feet (Appendix B) Waste fill was encountered to depths of up to 18 feet (boring 56094) but predominantly limited to depths less than 8 feet Waste fill/ash material was encountered in IHSSs 133 1 133 2 (northern half was confirmed to be an ash pit) 133 4 and in the two previously unidentified ash pits TDEM 1 and TDEM 2 (Figures 3 26 3 27 3 29 and 3 30) Waste ash material was also encountered in borehole 58093 between IHSSs 133 1 and 133 4 (Figure 3 26) The lateral extent of waste fill correlates well with the TDEM anomaly map in Figure 2 11

*Landslide* Landslide deposits were differentiated from the other geologic deposits presented in Figure 3 9 on the basis of the hummocky topography present. Because the colluvium was incorporated into the landslide deposits during the landsliding and colluvium closely resembles the textural characteristics observed in IHSS 115/196 landslide deposits will be referred to as colluvium.

*Colluvium* Colluvium is exposed south of the Rocky Flats pediment terrace (Figure 3 9) where the deposit was developed on the gently sloping bedrock surface Colluvium consisted primarily of sandy clayey gravel and cobbles and sandy clay The colluvium appears to mixed with and apparently mobilized into the landslide deposits on the eastern portion of IHSS 133 The thickness of colluvium ranged from 2 5 up to 34 feet

*Valley Fill Alluvium/ Piney Creek Alluvium* Valley fill alluvium (Piney Creek Alluvium of Figure 3 9) was encountered along Woman Creek and consisted primarily of sandy to silty-clayey gravel with cobbles The maximum thickness of valley fill alluvium was 5 to 10 feet

*Rockv Flats Alluvium* Rocky Flats Alluvium was encountered on the north side of IHSS 133 and consisted primarily of gravelly sand with some clay to sandy clay and clayey sand with some to trace gravel Thickness of the Rocky Flats Alluvium ranged from 27 feet (boring 55393) to 32 8 feet (boring 55493)

*Arapahoe/Laramie Formations* The undifferentiated Arapahoe/Laramie Formation in IHSS 133 is assumed to be the same as the bedrock encountered in IHSS 115/196 Bedrock lithology observed in boring 59894 northeast of IHSS 133 2 consisted predominantly of claystone with some thin interbeds and laminae of siltstone and sandstone The claystone was observed to be massive to thinly laminated containing trace ironstone nodules trace to some organics in the form of leaf imprints disseminated carbon and trace lignite interbeds with some thin interbeds and laminae of siltstone and sandstone Sandstone and siltstone interbeds (Fiure 3 8) from 0 5 to 10 feet in thickness consisted of very fine to fine grained clayey to silty sandstones and sandy to clayey siltstones slightly friable to well cemented trace ironstone nodules cross bedded to laminated with some soft sediment deformation structures and trace fossils with trace to some disseminated carbon

Sandy Claystone and clayey sandstone was encountered in boreholes east of IHSS 733 2 (boreholes 57493 57593 and 59494/59894) on the east side of IHSS 133 2 (boreholes 57093 and 57393) Sandy claystone was also encountered between IHSSs 133 3 and 133 4 (borehole 63093) and clayey siltstone was encountered on the west side of the north ash pit in IHSS 133 4 (55893)

### 3 8 2 2 Hydrogeology IHSS 133

The UHSU hydrogeology of the IHSS 133 area is characterized by the southerly slope toward Woman Creek and groundwater flow through saturated unconsolidated surface deposits (artificial fill waste fill colluvium/landslide deposits and valley fill alluvium) and the weathered bedrock of the Arapahoe/Laramie Formations) As described in Section 3 6 3 2 the LHSU consists of unweathered bedrock of the Arapahoe/Laramie Formations A total of twenty nine wells or piezometers (well points using teflon tubing mini wells using 1 inch PVC pipe and monitoring wells using 2 inch PVC pipe) were installed in the IHSS 133 area as part of the OU 5 RFI/RI investigation The UHSU potentiometric surface for October 1994 and May 1995 are presented in Figures 3 34 and 3 35 which represent the lowest and highest water level elevations respectively recorded during the period August 1994 to July 1995 Only two UHSU wells were dry during the May 1995 water level monitoring event and these wells were 51593 and 55794 Well 51593 is south of IHSS 133 3 and well 55794 is southwest of IHSS 133 3 These wells are dry and do not fully penetrate the surficial materials due to refusal during drilling Well 62693 which was constructed in an area of a seep was observed to be flowing at the surface during May 1995

Groundwater generally flows from the upgradient Rocky Flats Alluvium through the laterally continuous and intertonguing unconsolidated surficial materials in a south southeasterly direction until reaching the apex of Woman Creek (Figures 3 34 and 3 35) Along Woman Creek the groundwater flow direction changes to an easterly direction parallel to surface water flow The groundwater gradient appears to be strongly affected by seasonal fluctuations and from west to east across IHSS 133 For October 1994 the gradient is 0 09 foot/foot on the west side zero or unsaturated through the center and 0 07 foot/foot on the east side For May 1995 the gradient is 0 1 foot/foot on the west side 0 18 foot/foot through the center and 0 1 foot/foot on the east side Groundwater flow is downgradient along the contact between the overlying unconsolidated deposits and the low permeability claystone bedrock where there appears to be bedrock topographic lows

Recharge of the IHSS 115/196 area is primarily from upgradient precipitation infiltration Groundwater discharges to the surface in places of shallow bedrock as diffuse flow (seeps) and concentrated flow (springs) (Figures 3 15 and 3 16) Woman Creek is a losing stream for most of the year except for the wettest spring months (December March or April) Seasonal variations in recharge strongly affect the UHSU potentiometric surface (Figures 3 34 and 3 35) Figure 3 36 present hydrographs of wells located in the IHSS 133 area. Note the cyclic nature of the hydrographs for wells 58793 and 63093 which were monitored over a two year and one period respectively Seasonal fluctuations of 9 feet were observed in several of the wells located in IHSS 133 (wells 58793 63593 63693 and 56494) and over 15 feet in well 56294 southwest of IHSS 133 3

Hydraulic characteristics of the colluvium/landslide material in well 58793 in IHSS 133 were estimated during aquifer tests performed in 1993 (DOE 1994a) However the results of the test on well 58793 were inconclusive The well dewatered at a low pumping rate and no drawdown was observed in the observation wells (DOE 1994a)

Hydraulic conductivities of the valley fill alluvium/Piney Creek Alluvium in IHSS 133 were estimated in well 5686 during aquifer test evaluations for the RFETS Hydrogeologic Characterization Report which ranged from 1 0E 04 to 5 0E-05 cm/s (EG&G 1995b)

### 3 8 3 IHSS 142 (C Series Ponds)

This section discusses the physical setting geology and hydrogeology of IHSSs 142 10 and 142 11 Also because these IHSSs are actually ponds a section describing their hydrology is included

Ponds C 1 (IHSS 142 10) (DOE 1994a, Appendix C Photo 68) and C 2 (IHSS 142 11) (DOE 1994a, Appendix C Photo 74) are located along Woman Creek within the southeast section of the south buffer zone on the eastern reach of Woman Creek (Figure 3 15) These ponds are approximately 2 000 feet apart, with Pond C 1 to the west or upstream of Pond C 2 along Woman Creek According to Merrick Engineering (1992) the maximum storage capacity of Pond C 1 is 5 2 acre feet and Pond C 2 is 69 4 acre feet The estimated average retention in Pond C 1 is 29 percent or 1 5 acre feet and Pond C 2 is 20 percent or 14 acre feet (Patton 1995) Sediment from erosional processes has been deposited into these ponds since then construction thereby decreasing their storage capacities (see Section 3 4)

#### 3 8 3 1 Geology IHSS 142

The geology of IHSSs 142 10 and 142 11 has been characterized from information obtained from monitoring well boreholes and the Geologic Characterization Report for The Rocky Flats Environmental Technology Site (EG&G 1995a) The surficial geology within the area of IHSSs 142 10 and 142 11 is for the most part nonexistent because these IHSSs primarily encompass Ponds C 1 and C 2 However the surficial material surrounding the ponds consists mainly of artificial fill Small areas along the north and west shores of both ponds and a larger area east of Pond C 1 and north of Pond C 2 consist of Piney Creek Alluvium (Figure 3 10) (EG&G 1995a) Descriptions of these units as well as an IHSS specific description of the alluvial thickness are provided in the following paragraphs

Other surficial materials surrounding these IHSSs are primarily landslide deposits and colluvium (Figure 3 10) both of which have been described in previous sections of this report.

The valley filled alluvium that was encountered in the wells east of IHSSs 142 10 and 142 11 ranged in thickness from 4 to 10 feet The thickness of the valley fill alluvium encountered in wells 50092 and 50192 (east of IHSS 142 10) and 50292 (east of IHSS 142 11) was approximately 10 feet and consisted predominantly of a sandy or silty gravel and silty sands overlain with a silty clay/clayey silt (Figures 3 37 and 3 38) The thickness of the valley fill alluvium encountered in well 51193 (east of IHSS 142 10) was approximately 7 1 feet (Figure 3 38) and the thickness of the valley fill alluvium in the small diameter wells (drilled for aquifer testing) surrounding well 51193 was 5 5 feet in well 63293 4 feet in well 63393 and 9 5 feet in borehole 63493 The valley fill alluvium encountered at these locations is assumed to be the same as described above

Valley fill alluvium may not be present beneath the detention ponds because the top 5 to 10 feet of the surficial materials was removed during construction The base of the C 2 pond is keyed into the bedrock of the Laramie Formation but C 1 Pond is not keyed into bedrock The sediment that has been deposited in the ponds since their construction is unconsolidated and consists of fine grained organic silts and clays (DOE 1992a)

Based on borehole data, the bedrock underlying the areas adjacent to IHSSs 142 10 and 142 11 consists of claystone Claystone bedrock provides a relatively impermeable layer As shown on the Geologic Map of the Rocky Flats Environmental Technology Site and Vicinity (Plate 2 1 EG&G 1995a) the bedrock beneath these ponds appears to be the Laramie Formation (Figure 3 4)

### 3 8 3 2 Hydrogeology IHSS 142

The hydrogeology of the C 1 and C 2 Ponds is controlled primarily by surface water as both ponds are located along Woman Creek (Figure 1 2) Both ponds were created by dams The C 1 Pond is within the channel of Woman Creek and is recharged by stream flow and possibly by groundwater inflow during the wetter months Woman Creek upgradient of the C 1 pond is gaining during the wet months of December through March or April but losing the rest of the year Immediately downgradient of the C 1 pond Woman Creek is losing year round During the drier months the C 1 pond may act as a source of recharge to the groundwater system The water level in the C 1 pond is controlled by a gate Two wells (50092 and 51193) located at the base and east of the C 1 dam perennially contain groundwater (Figure 2 13) The

C 1 dam is not keyed to bedrock and groundwater appears to flow beneath the dam Dam C 1 has a hydraulic height of 15 feet and is classified as a small size dam (Army Corps of Engineers 1984)

The C 2 Pond is located farther east along a losing reach of the original Woman Creek stream channel Woman Creek has been diverted around the C 2 pond and surface water from Woman Creek flows into the pond only during periods of high flow The SID drains into the C 2 Pond and therefore accepts surface water drainage from the industrialized area upgradient of the SID The dam at C 2 Pond is keyed into bedrock and effectively stops groundwater flow from moving out of the pond and cutting off flow to the natural stream channel east of the dam (Figure 2 13) This is evidenced by wells 50192 and 50292 east of the base of the dam which are perennially dry Dam C 2 has a hydraulic height of 35 5 feet and is classified as a small size dam (Army Corp of Engineers 1984) The C 2 Pond is a terminal pond and the water level in the pond is controlled by pumping and transferring the water to the Broomfield Diversion Ditch

### 3 8 4 IHSS 209 and Other Surface Disturbances

This section discusses the physical setting geology and hydrogeology specific to IHSS 209 the Surface Disturbance West of IHSS 209 and the Surface Disturbance South of the Ash Pits

Three separate surface disturbances are described in this section These areas include IHSS 209 the Surface Disturbance West of IHSS 209 and the Surface Disturbance South of the Ash Pits IHSS 209 is located approximately 1 000 feet southeast of Pond C 1 (Figure 3 15) This area was included as an IHSS because unknown activities took place in this area of shallow excavations and surface disturbances This IHSS covers approximately 5 2 acres and is located along a long narrow plateau bounded to the north, east and south by a uniform slope leading into the Woman Creek drainage A dirt road transects this IHSS and circles near the eastern boundary of the IHSS Three excavations are located within the boundary of this IHSS (Figure 1 5) Two depressions which periodically retain water are present near the northern and southwestern boundary of this unit (Figure 1 5) (DOE 1992a) Photo 82 in TM15 Appendix C shows the depression at the southwestern end of the IHSS The depth of this depression is about five feet.

A second surface disturbance the Surface Disturbance West of IHSS 209 is located approximately 1 500 feet west of IHSS 209 (Figures 1 5 and 3 15) and consists of several small disturbed areas This disturbance covers an area of about 62 500 square feet (DOE 1992a) and is located on a fairly shallow slope that faces north toward Woman Creek

A third surface disturbance area, the Surface Disturbance South of the Ash Pits is located approximately 1 200 feet south of the IHSS 133 area and south of Woman Creek (Figure 3 15) This area consists of four excavations and a disturbed area that is covered with boulders (DOE 1994a, Appendix C Photo 89) on the western side of the disturbed area (Figure 1 6) Two excavations trend along northeast southwest axes each approximately 30 feet wide and 400 feet long Photos 83 and 84 in TM15 Appendix C show one of the excavated trenches looking southwest and northeast respectively These photos show this trench to be approximately 5 to 8 feet wide and about 2 feet deep A horseshoe shaped area is located northeast of the parallel excavations and a third excavation is located to the southwest (DOE 1992a) This surface disturbance is located on top of a high plateau that is situated along the southern portion of the OU It is sloped on the north and southeast Two ephemeral streams drain this area. These streams flow into Woman Creek from the north and southeast sides of the disturbed area

### 3 8 4 1 Geology

The geology of IHSS 209 and the other surface disturbances have been characterized from information obtained from boreholes and the Geologic Characterization Report (EG&G 1995a) There are a number of geologic units present at IHSS 209 and the other surface disturbances including artificial fill landslide deposits Rocky Flats Alluvium colluvium and the Arapahoe/Laramie Formations Descriptions of these units as well as an IHSS specific description of the alluvial thickness are provided in the following paragraphs

*IHSS 209* The surficial geology of IHSS 209 consists primarily of Rocky Flats Alluvium with three small pockets of artificial fill (Figure 3 10) The surface materials surrounding the IHSS have been identified as landslide deposits (EG&G 1995a) (Figure 3 10)

Artificial fill landslide deposits colluvium and the Rocky Flats Alluvium present in IHSS 209 have been described in previous sections The only subsurface data available are from borehole 41191 (Figure 3 36) These data indicate that the alluvial material is approximately 31 feet thick on top of this knoll Also based on data from borehole 41191 the bedrock underlying IHSS 209 consists of claystone This claystone most likely belongs to the Arapahoe Formation as inferred from Plate 2 1 of the Geologic Characterization Report (EG&G 1995a) (Figure 3 3) A discussion of the Arapahoe Formation is provided in Section 3 6

*Surface Disturbance West of IHSS 209* The surficial geology of the Surface Disturbance West of IHSS 209 has recently been mapped According to the Surficial Geologic Map of the Rocky Flats Environmental Technology Site and Vicinity (EG&G 1995a) the area is covered with landslide deposits (Figure 3 10) A description of landslide deposits was previously provided in Section 3 6 According to data from borehole 57693 there is no alluvial material at this location The geological material encountered in borehole 57693 consisted of highly to slightly weathered claystone to a depth of 6 feet Figure 3-4 (Plate 2 1 EG&G 1995a) shows that both the Arapahoe and Laramie Formations underlie this IHSS Descriptions of these two formations were presented in Section 3 6

*Surface Disturbance South of the Ash Pits* Surficial geology of the Surface Disturbance South of the Ash Pits consists mostly of Rocky Flats Alluvium with about one third of the area covered with colluvium (Figure 3 9) The surface materials surrounding the IHSS have been identified as landslide deposits (EG&G 1995a) (Figure 3 9) Summary descriptions of these landslide deposits were provided in Section 3 6

Based on borehole data, the Rocky Flats Alluvium on top of the knoll is approximately 30 feet thick and, off to the side of the knoll the thickness decreases to approximately 24 feet in borehole 57893 (Figure 3 39) The Rocky Flats Alluvium consisted predominantly of a gravelly sand with some interbedded silty or clayey sands (Figure 3 39)

Bedrock data from the IHSS are from boreholes 57793 and 57893 (borehole 57993 did not reach bedrock) The bedrock encountered in borehole 57793 consisted of claystone However the bedrock encountered in borehole 57893 consisted of clayey sandstone at 24 4 feet and grading to a sandstone at 30 4 feet. Two other boreholes that are nearest to the surface disturbance include borehole 41391 and well 0590/borehole 590 and borehole 5386 Borehole 41391 and well 0590 encountered a claystone and borehole 5386 was not logged Borehole 41391 southeast of the IHSS encountered 38 feet of rocky Flats Alluvium four feet silty claystone 4 5 feet of silty sandstone to clayey siltstone claystone to a depth of 130 feet, 0 5 feet of siltstone 14 feet of claystone one foot of silty sandstone then claystone to a total depth of 202 feet.

Three boreholes located in the area of the Surface Disturbance South of the Ash Pits encountered sandstone Two sandstone units were encountered in borehole B402189 at depths of 6 feet and 20 5 feet below top of bedrock Because each of these three boreholes encountered sandstone at depths of 24 4 28 and 33 feet it may be possible that they have penetrated the same lithologic unit According to Plate 5 9 of the Geologic Characterization Report (EG&G 1995a) these boreholes are all interpreted to have penetrated the Arapahoe No 1 sandstone The thickness of these sandstones ranges from 5 5 (borehole 57893) to 16 feet (second sandstone encountered in borehole B402189) Both boreholes B402189 and B405889 encountered a sandstone that was 12 feet thick.

### 3 8 4 2 Hydrogeology

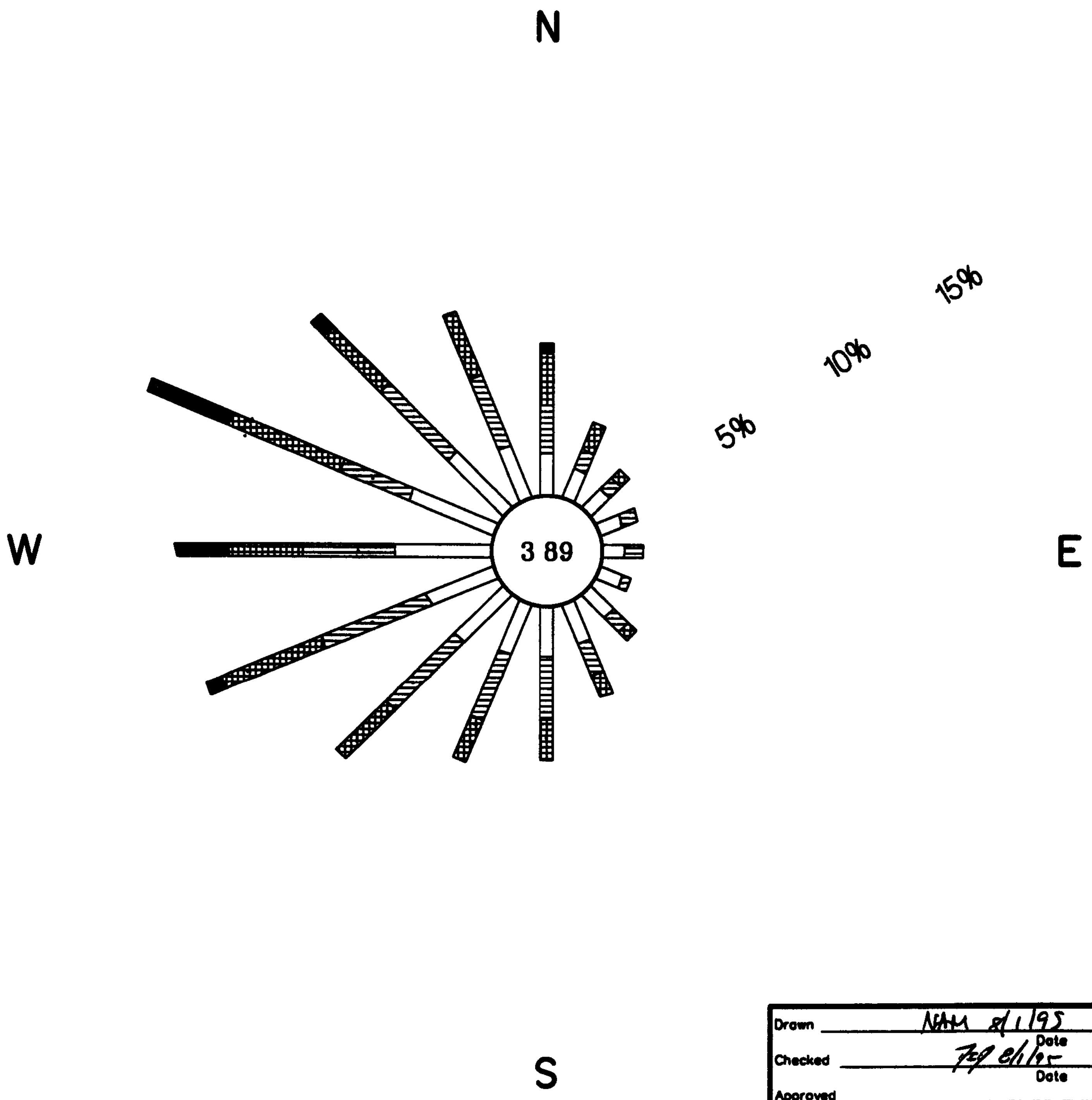
The hydrogeology of IHSS 209 and the other surface disturbances on the south side of Woman Creek were not characterized for hydrogeology with the installation of wells during RFI/RI activities Generally groundwater flows into these areas from areas upgradient and then downslope toward the north to the apex of Woman Creek. All are located on or at the edge of the Rocky Flats Alluvium pediment. The UHSU water table south of Woman Creek was not included in the potentiometric map of OU 5 (Figure 5 15) but is sufficiently described and presented in the Geological and Hydrogeologic Characterization Reports (EG&G 1995a and b)

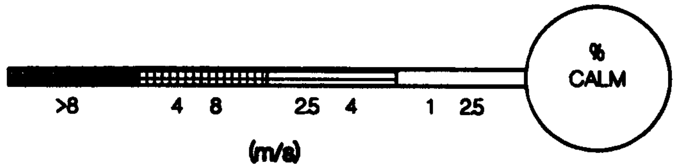
IHSS 209 was dry when investigated during the summer of 1992 It is located on the Rocky Flats Alluvium pediment, and contains small areas of artificial fill (Figure 3 10) Recharge is from infiltration of precipitation Since the site is on the drainage divide between Woman Creek and Smart Ditch groundwater is expected to flow north east and south toward both drainage basins No seeps were observed in this area (EG&G 1994a)

The Surface Disturbance West of IHSS 209 occurs on the top of the slope adjacent to the Rocky Flats Alluvium pediment outcrop within landslide material (EG&G 1992e) Bedrock is essentially at the surface and the area was dry when drilled during the summer months of 1992 The area is within the Woman Creek drainage basin and when saturated conditions exist groundwater flows to the east and north Recharge is from infiltration of precipitation Discharge is through evapotranspiration and downgradient groundwater and surface water flow Figure 3 15 shows the location of an ephemeral seep present to the west of the IHSS (EG&G 1994a)

The Surface Disturbance South of the Ash Pits is located on the Rocky Flats Alluvium pediment with some colluvium (EG&G 1992e) It lies on a minor groundwater divide within the Woman Creek drainage basin Groundwater recharge is primarily from precipitation infiltration A small tributary of Woman Creek bounds the southeastern edge of the disturbance and a number of perennial and ephemeral seeps bound the northwestern edge (EG&G 1994a) Groundwater discharges to the seeps and the tributary to the southeast, and flows to the north through unconsolidated surficial materials toward Woman Creek Discharge also occurs through evapotranspiration

NIGHT 1991




Source EG&G Rocky Flats n d Crocker pers comm 1993

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| Drawn NAM 8/1/95 | Date |
| Checked TJG 8/1/95 | Date |
| Approved | Date |
| FILE OU5-3 2.DWG | |

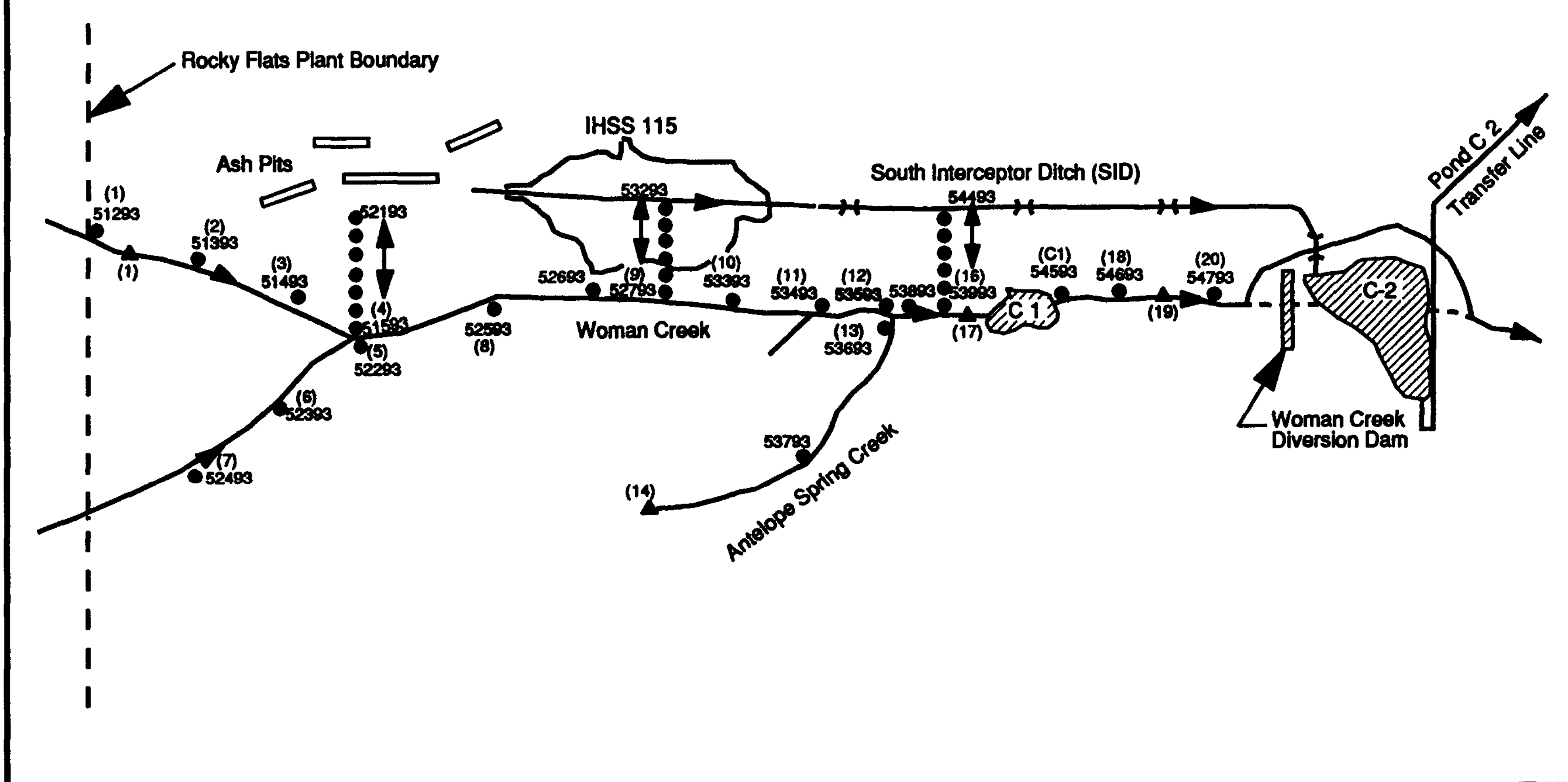
**WIND ROSE FOR THE ROCKY FLATS PLANT (NIGHT 1991)**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-2



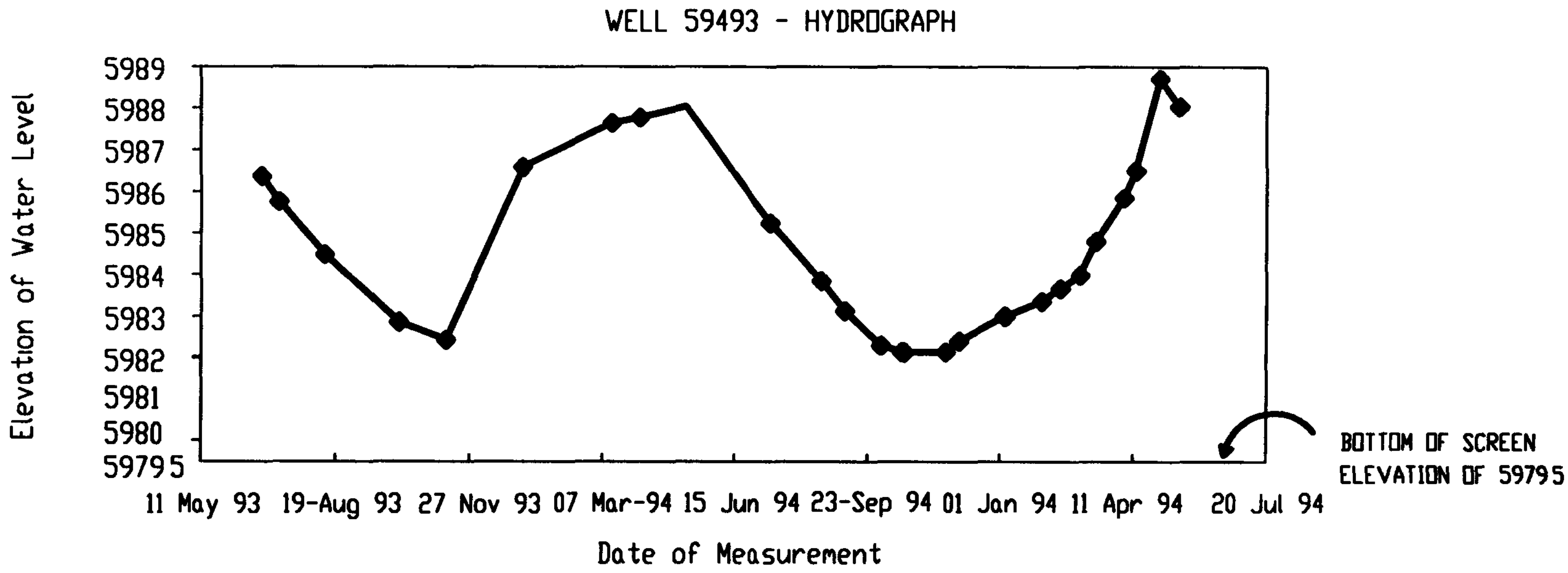

## LEGEND

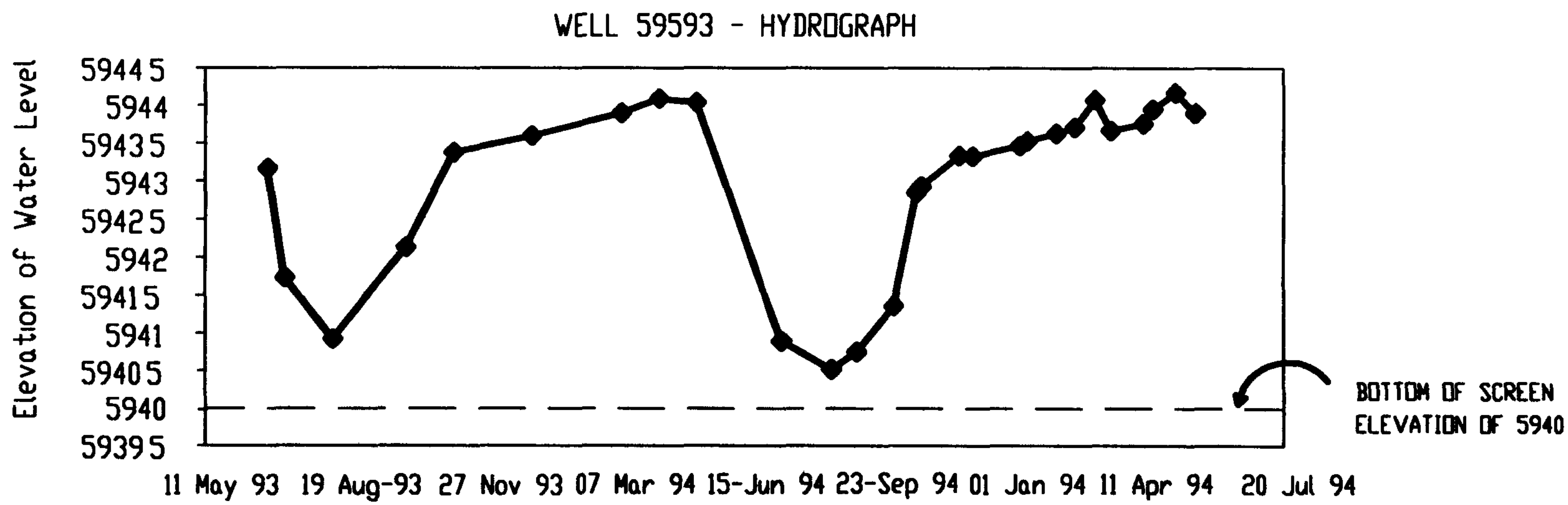
| | |
|---|---|
| (14) | Flow Measurement Sites |
| 52593 ● | Wellpoint Monitoring Sites |
| (14) ▲ | Gain/Loss Location if Different from Wellpoint Location |
| → | Direction of Surface Water Flow |
| ⟗ | Culvert |

DRAWN NAM 8/1/95 DATE
CHECKED [illegible] 8/1/95 DATE
APPROVED ______ DATE
FILE OU5-3-6.DRW

LOCATION OF SHALLOW WELLPOINT MONITORING AND FLOW MEASUREMENT SITES
WOMAN CREEK DRAINAGE BASIN

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5 WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE

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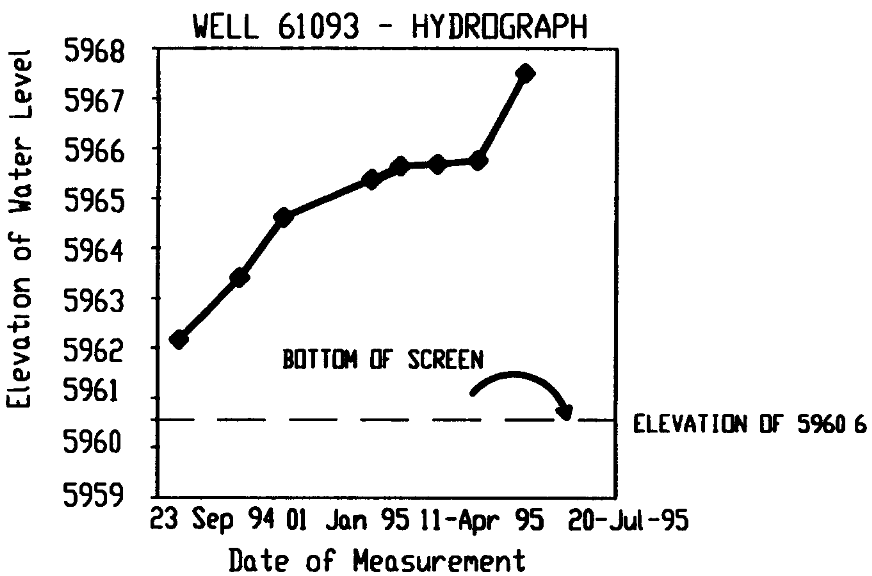
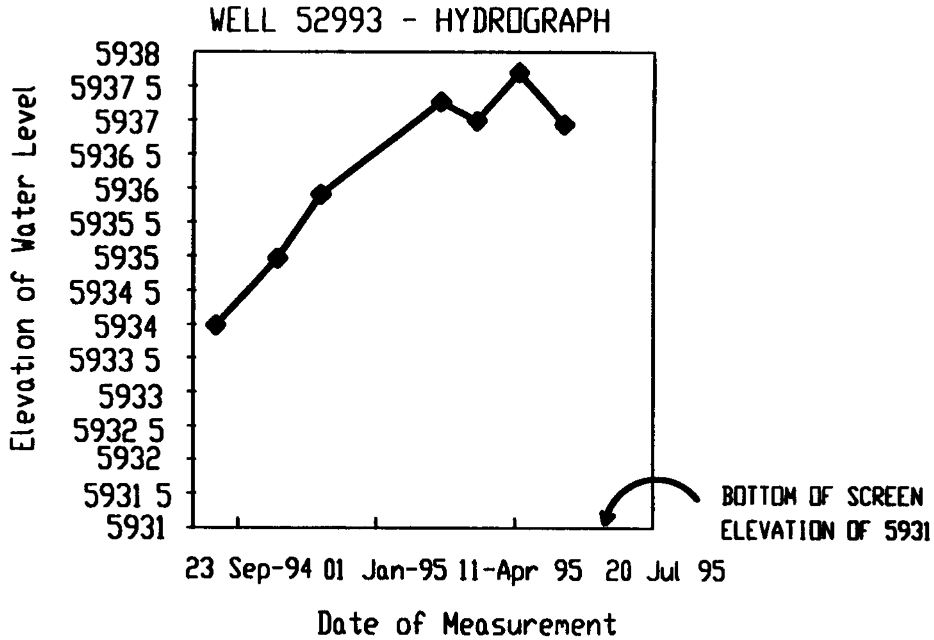
| Checked Rmz 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved ______ Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5 3 22 DWG | FIGURE 3-22 |

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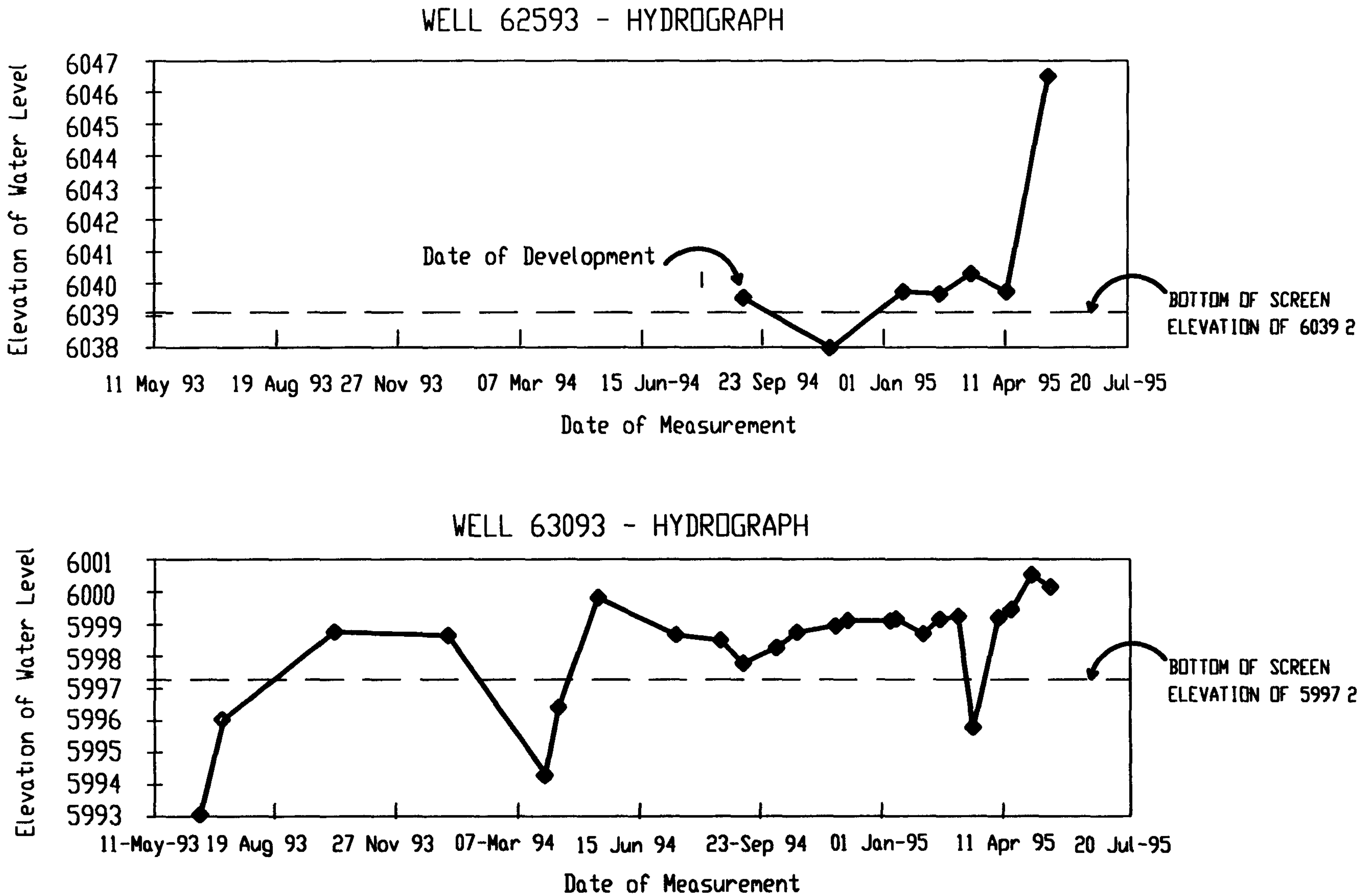
| Checked 7E7 9/28/95 Date | **ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE** |
| Approved M.?.W. 9/29/95 Date | **OU5 - WOMAN CREEK PRIORITY DRAINAGE** |
| | **RFI/RI REPORT** |
| FILE OU5 3 23.DWG | **FIGURE 3-23** |

Source of Data RFEDS

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| Checked 7EQ 10/2/95 Date | **ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE** |
| Approved MRW 10/10/95 Date | **OU5 - WOMAN CREEK PRIORITY DRAINAGE** |
| | **RFI/RI REPORT** |
| FILE OU5 3-36 DWG | **FIGURE 3-36** |

Source of Data RFEDS

**Table 3-1**
**Soil Units Within the OU 5 Area**

| Series | Family | Phase | Mimimum Maximum Slope (%) | Location (ie hillside ridge etc ) | Infiltration Rate | Permeability | Water Capacity | Water Erosion Hazard | Shrink Swell Potential |
|---|---|---|---|---|---|---|---|---|---|
| Denver Kutch Midway | Torretic Argiustolls | clay loam | 9 25 | hillsides ridge | slow | slow | high/low | severe | high |
| Flatirons | Aridic Paleustolls | very cobbly sandy loam | 0-3 | ridges | slow | slow | low | slight | moderate |
| Denver | Torretic Argiustolls | clay loam | 5-9 | hillside | slow | slow | high | severe | high |
| Nederland | Aridic Argiustolls | very cobbly sandy loam | 15-50 | ridges hillsides | moderate | moderate | moderate | severe | low |
| Haverson | Ustic Torrifluventis | loam | 0-3 | flood plain | slow | moderate/ slow | high | slight | low |
| Leyden Pnmen Standley | Aridic Argiustolls | cobbly clay loam | 15-50 | hillsides | slow | slow | low/high | severe | moderate to high |

Source Department of Agriculture (1980)

# 4 0 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of COCs within OU 5 were evaluated for various media, including surface soil subsurface soil groundwater surface water seep water pond sediment seep sediment and stream sediment These evaluations were performed in accordance with Section 3 4 1 3 of *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988c) Section 4 1 presents a discussion of data used in the evaluation of the nature and extent of contamination as well as an assessment of the quality of those data Section 4 2 presents a summary of the comparison of these data to background values The distributions of those analytes identified as COCs—based on the methodology described in Section 4 2—are discussed in Section 4 3 Section 4 4 presents a summary of the contaminant assessment

## 4 1 DESCRIPTION OF DATA USED FOR CONTAMINANT ASSESSMENT

### 4 1 1 Description of Data

Data used for preparation of this report were collected during the OU 5 Phase I field program which was conducted in two stages The first stage began in August 1992 and continued through November 1993 The second stage began in August 1994 after TM15 was finalized and ended in June 1995 First stage data, which were used for identifying constituents as COC are documented in TM15 (DOE 1994a) Data from both stages have been used to evaluate the nature and extent of contamination All data were obtained from the Rocky Flats Environmental Database System (RFEDS)

Data obtained from RFEDS were carefully reviewed and unusable data were removed from the working data sets prior to being used in any analysis These steps are documented in Appendix A of DOE (1995a)

### 4 1 2 Evaluation of Data Usability

The OU 5 Work Plan (DOE 1992a) established the data quality objectives (DQOs) for each analyte group and medium sampled DQOs are expressed in quantitative and qualitative terms of precision accuracy representativeness completeness and comparability These parameters are routinely referred to as the PARCC parameters

Appendix O presents a data quality and usability summary for the OU 5 RFI/RI The data usability summary evaluates how data quality supports or limits the achievement of the prescribed DQOs and how it affects data usability for the RFI/RI The discussion presented in Appendix O indicates that the data collected for the OU 5 RFI/RI generally meet or exceed the DQOs established in the OU 5 Work Plan (DOE 1992a)

## 4 2 COMPARISON TO THE SITE BACKGROUND DATA

Data collected prior to implementation of TM15 (DOE 1994a) were compared quantitatively to background data. As described in TM15 constituents found in samples of surface soil subsurface soil groundwater surface water and stream sediments were compared to the corresponding $UTL_{99/99}$ as provided in the 1993 Background Geochemical Characterization Report (DOE 1993a) For those analytes where a $UTL_{99/99}$ was not provided by the Background Geochemical Characterization Report, the maximum background concentration was used for this comparison Because the background concentrations of organic compounds are assumed to be zero therefore any detected organic compound was considered to be an indication of possible contamination The data documented in TM15 provided initial indications of contamination based on data from field investigations completed in August 1993 and groundwater samples collected through November 1993

In Section 2 0 Tables 2 7 through 2 9 show a comparison of concentrations from the combined stage one and stage two data sets to both background data and the OU 5 data collected prior to implementation of TM15 These comparisons show the statistical effects to the data set after integrating the data collected during the implementation of TM15

The COCs described in TM11 (DOE 1995a) were derived from the same data set reported in TM15 (DOE 1994a) The COCs were selected based on the results of statistical comparison to background concentrations assessments of toxicity evaluation of detection frequencies and review of the spatial/temporal distribution of analyte concentrations The resulting COCs are listed in Table 6 25 During selection of COCs the concentrations of each analyte were compared to those of the same analyte in the corresponding background medium However data for pond sediment in OU 5 were compared to background data for seep sediments due to the lack of background pond data, and because flow conditions for ponds and seeps are similar (both have relatively long residence time) (DOE 1995a) Background comparisons for inorganic analytes were performed according to the procedures given in the Guidance Document Statistical Comparisons of Site Background Data in Support of RFI/RI Investigations (EG&G 1994b) which was primarily based on the methodology proposed by

Gilbert (1993) The formal statistical tests include the Gehan test. Slippage test Quantile test and t test Comparisons of the analytical results to the background $UTL_{99/99}$ for each analyte in each medium were performed to ensure that isolated areas of contamination (i e hot spots) were not overlooked Appendix A of the COC TM11 (DOE 1995a) presents a detailed description of the conditions for applying each of these tests

## 4 3 THE EXTENT OF COCs IN AND AROUND OU 5 IHSSs

The nature of the wastes in the OU 5 IHSSs has been discussed in Section 1 0 and in TM15 (DOE 1994a) for the field investigation outlined in the OU 5 Work Plan (DOE 1992a) Section 6 2 discusses the identification of COCs for each medium These COCs are summarized in Table 6 25 and listed below

- Surface Soils Aroclor 1254 benzo(a)anthracene benzo(a)pyrene benzo(b)fluoranthene copper dibenzo(a h)anthracene fluoranthene indeno(1 2 3 cd)pyrene mercury pyrene silver uranium 233/234 uranium 235 and uranium 238
- Subsurface Soils antimony Aroclor 1254 benzo(a)anthracene benzo(a)pyrene benzo(b)fluoranthene beryllium cadmium copper molybdenum nickel silver uranium 233/234 uranium 235 and uranium 238
- Groundwater aluminum barium beryllium manganese vanadium americium 241 plutonium 239/240 radium 226 uranium 233/234 uranium 235 and uranium 238
- Surface Water barium lithium strontium americium 24 uranium 233/234 and uranium 238
- Seep Water acetone 1 1-dichloroethene (1 1 DCE) 1 2 dichloroethene (1 2 DCE) PCE and TCE
- Pond Sediment mercury zinc americium 241 plutonium 239/240 uranium 233/234 uranium 235 and uranium 238
- Seep Sediment antimony beryllium zinc uranium 233/234 uranium 235 and uranium 238
- Stream Sediment copper mercury zinc americium 241 and plutonium 239/240

The extent and variation of concentration of the COCs are graphically displayed as symbols on Figures 4 1A through 4 12 Data used to develop these figures represent a combined data set that includes the pre TM15 data and data collected during implementation of activities specified in TM15 (DOE 1994a)

For metal and radionuclide COCs the following concentration intervals (levels) were used to characterize and display concentrations

- Level 5 concentrations/activities that are less than or equal to the arithmetic mean background concentration/activity
- Level 4 concentrations/activities that exceed the background mean but are less than or equal to the background mean plus one standard deviation
- Level 3 concentrations/activities that exceed the background mean plus one standard deviation but are less than or equal to the background mean plus two standard deviations
- Level 2 concentrations/activities that exceed the background mean plus two standard deviations but are less than or equal to the background mean plus three standard deviations and
- Level 1 concentrations/activities that exceed the background mean plus three standard deviations

As part of the COC selection process as discussed in the COCTM (DOE 1995a) and in Chapter 6 0 concentrations/activities were compared to the corresponding background $UTLs_{99/99}$ The $UTL_{99/99}$ in most cases is comparable to the background mean plus three standard deviations Therefore four of the five symbols on Figures 4 1 through 4 12 indicate concentrations that are not above the $UTLs_{99/99}$ for metals and radionuclides

For organic COCs the following concentration intervals (levels) were used to characterize concentrations

- Level 4 concentrations that were detected at levels less than the reporting limit
- Level 3 concentrations that exceed the reporting limit but are less than or equal to ten times the reporting limit
- Level 2 concentrations that exceed ten times the reporting limit but are less than or equal to 100 times the reporting limit and
- Level 1 concentrations that exceed 100 times the reporting limit.

The symbol at each sample location in Figures 4 1A through 4 12 indicates the greatest concentration level for one or more COCs The symbols show the general distribution of the COCs and the general deviation from background mean concentrations Boxes associated with the symbols list the individual COCs that show concentrations greater than the background mean The upper panel in each box corresponds to the level 1 concentration intervals described above that is the box contains a list of inorganic COCs found at concentrations/activities exceeding three standard deviations above the background mean For organic chemicals the box contains a list of those compounds found at concentrations exceeding 100 times the reporting limit The lower panel lists COCs in the level 2 concentration interval All metal and radionuclide COCs not listed anywhere in the box are less than two standard deviations above the background mean All organic COCs not listed anywhere in the box were found only at levels less than ten times the reporting limit. Tables 4 1 through 4 11 present data used to create Figures 4 1A through 4 12

The following subsections describe the nature and extent of contamination associated with each IHSS in OU 5 However all surface water and sediment data are presented under IHSS 142 in order to be consistent with the AOCs presented in Section 6 0 of this RFI/RI report

### 4 3 1 IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)

#### 4 3 1 1 Surface Soil

Data used to determine the extent of metal COCs for IHSS 115/196 surface soil (copper mercury and silver) are presented in Table 4 1 Figures 4 1A B C,D show the extent of these COCs The central area of IHSS 115 contains the greatest number of locations that have COCs at level 1 concentrations copper mercury and silver are all found at level 1 concentrations in this area. Construction of the outfall pipe (Section 1 2 2 1) and slumping of surficial materials may have brought contaminated landfill material to the surface in the central area of IHSS 115 Three sampling locations (Figure 4 1C) are just south of this area and outside the IHSS boundary of these location SS509693 is the only one that has a COC concentration at level 1 (mercury 0 26 mg/kg)

Data used to plot the extent of radionuclide COCs for surface soil (the three isotopes of uranium) are presented in Table 4 2 These data are illustrated on Figures 4 2A B C D The center of IHSS 115 contains the greatest number of locations that have radionuclide COCs that exceed the background mean plus three standard deviations (level 1) All three uranium isotopes are found in the level 1 concentration interval there As indicated above construction of the outfall pipe and slumping of surficial materials may have brought contaminated landfill material to the surface in this area. Three locations (SS509693 SS510293 and SS505893 Figure 4 2D) containing uranium isotopes at level 1 concentrations are located south of this area, just outside of the IHSS boundary

Data used to plot the extent of organic COCs for surface soil are presented in Table 4 3 These data are shown on Figures 4 3A B C All of the locations where organic COCs were detected are in the IHSS 115/196 area. Locations of detected organic COCs correspond with the location of the soil gas anomalies (Section 2 2 1 2) The highest concentrations were detected at location SS510593 (Figure 4 3C) where all of the organic COCs were found at concentrations greater than 10 times the reporting limit No concentrations greater than the reporting limit were found outside the boundary of IHSS 115 although two locations immediately south of IHSS 115 showed detected concentrations that were greater than the instrument detection limit but less than the contract required detection limit

### 4 3 1 2 Subsurface Soil

Data used to plot the extent of metal COCs for IHSS 115/196 subsurface soil (antimony beryllium cadmium copper molybdenum nickel and silver) are presented in Table 4 4 Figures 4-4A B C D show the general extent of these COCs The location symbols in this figure show the maximum concentration level of any metal COC in each borehole without regard to the depth sampled As discussed previously the boxes show metal COCs that were detected at level 1 and level 2 concentrations A metal may appear in both panels of a box because of its depth related variability in concentration

In IHSS 115 copper and nickel were found at several locations in level 1 concentrations Antimony cadmium molybdenum and silver were also detected at this concentration level All but one of these samples with metals in the highest concentration interval were from depths of less than 13 feet in an area where waste was identified in boreholes Moreover with only one exception those boreholes in which waste was not identified contained lower concentrations of metals The exception was the nickel concentration at location 63193 (Figure 4-4C) where the composited interval from 12 to 20 ft contained 84 9 mg/kg nickel However this concentration only marginally exceeds the background mean plus three standard deviations Although waste was not identified in this borehole the borehole is in an area where landfill materials were relocated during construction of the SID Cadmium copper and nickel were also detected at level 2 concentrations within the area where boreholes did not contain the waste material One borehole (57994 Figure 4 4C) south of the central area of the landfill and the IHSS boundary contains copper and nickel in the upper six feet at level 2 concentrations These observations indicate that the greatest concentrations of metal COCs are within IHSS 115 and have about the same vertical distribution as the wastes Downslope from the IHSS metal COCs were detected at lower concentrations

Data used to plot the extent of radionuclide COCs for subsurface soil (the three isotopes of uranium) are presented in Table 4 5 These data are summarized on Figure 4 5A B

The distribution of radionuclides in subsurface soil at IHSS 115/196 is similar to that of metal COCs samples containing radionuclide COCs at level 1 and level 2 activities were collected within the IHSS boundary from the upper 13 feet of subsurface soil (Table 4 5) An exception to this observation on the vertical distribution is for a sample collected from below 19 5 feet in borehole 58693 (Figure 4 5D) that contained uranium 238 at 1 7 pCi/g (level 2) The radionuclides tend to be associated with waste material and more than 15 ft of waste was identified in borehole 58693 Waste material was identified in all IHSS 115/196 boreholes with level 1 and level 2 activities with the exception of samples BH50087AS from borehole 50692 and BH50603AS from borehole 61093 (Figure 4 5D) These two boreholes contained no identified waste Borehole 50692 is located in the surface disturbance at the east end of IHSS 115 Sample BH50087AS was collected from a composited interval from 0 to 6 feet and may therefore be influenced by surface soil contamination Borehole 61093 is located in the central portion of the landfill within a slump that is surrounded by waste Therefore the radionuclides in the sample from 61093 are likely to be associated with waste The only borehole outside the IHSS boundary that contained a radionuclide COC at an activity exceeding the background mean plus two standard deviations was 61293 (Figure 4 5C) where uranium 238 was detected with an activity of 0 3395 pCi/g in the sample collected from 6 to 10 6 feet deep These observations indicate that elevated activities of radionuclide COCs are essentially contained within the waste material area although the occurrence of uranium 325 at an elevated concentration in borehole 61293 is unexplained

Data used to plot the extent of organic COCs in subsurface soil are presented in Table 4 6 These data are summarized on Figures 4 6A B The greatest number of locations that have organic COCs are located in the vicinity of IHSS 196 where the thickest section of waste was penetrated Organic COCs were also detected at the soil gas anomaly in the central portion of IHSS 115 (Section 2 2 1 2 2) The two level 3 concentrations of COCs at locations 56694 and 57594 (Figure 4 6A) outside of IHSS 115 are composited samples of drilling mud from deep boreholes These samples contained benzo(a)pyrene Evaluation of the spatial distribution of these COC concentrations indicates that organic COCs are restricted to areas within the waste material of IHSS 115/196

#### 4 3 1 3 Groundwater

Data used to plot the extent of metal COCs (aluminum barium beryllium manganese and vanadium) dissolved in IHSS 115/196 groundwater are presented in Table 4 7 These data are summarized on Figure 4-7A B The extent of dissolved metals rather than total metals is presented to provide a meaningful interpretation of groundwater chemistry (EG&G 1995c) The concentrations of total metals includes those metals contained in or absorbed onto suspended sediments which may be affected by factors unrelated to the extent or degree of groundwater contamination Dissolved manganese and barium are present at level 1 and level 2 concentrations within the landfill Only two sampling locations downgradient from IHSS 115 (61293 and 58094 Figure 4 7A) yielded samples with concentrations of dissolved metals at level 1 or level 2 Dissolved barium and manganese were detected at levels 1 and 2 in the sample obtained in January 1995 from monitoring well 61293 (Figure 4 7A) In addition dissolved manganese was detected at a level 3 concentration at location 59594 upgradient from the landfill (Figure 4 7A) These observations indicate that manganese and barium are the dominant metal COCs associated with IHSS 115 although their distribution does not seem to be well correlated with waste materials

Data used to plot radionuclide COCs (americium 241 plutonium 239/240 radium 226 and the three isotopes of uranium) in groundwater are presented in Table 4 8 These data are summarized on Figure 4 8A Dissolved radium 226 was detected with level 1 or level 2 activities at three locations in IHSS 115 No level 1 or level 2 activities of dissolved radium 226 have been detected downgradient of IHSS 115 Radium 226 seems to be the only radionuclide present at elevated activities in the groundwater of IHSS 115

#### 4 3 1 4 Surface Water

Distribution of COCs in IHSS 115/196 surface water is discussed in Section 4 3 3 1

#### 4 3 1 5 Seep Water

Seep water was only sampled at two locations (62793 and 62893) in IHSS 115/196 Only location 62893 at the northeast edge of the landfill contained any of the COCs All detected values were trace detections of organic compounds

#### 4 3 1 6 Seep Sediments

Seep sediment samples were only collected at the two IHSS 115/196 locations where seeps occur (Figure 2 12) TM15 (DOE 1994a) contains a detailed discussion of results for these samples The sediment sample collected adjacent to seep water sampling location 62893 contained antimony at a concentration exceeding the $UTL_{99/99}$ Neither of the two sediment samples contained radionuclide COCs exceeding the corresponding UTLs

### 4 3 2 IHSS 133 (Ash Pits)

#### 4 3 2 1 Surface Soil

Data used to plot metal COCs in IHSS 133 surface soil (copper mercury and silver) are presented in Table 4 1 Figure 4 1D summarizes the extent of these COCs Two locations (SS513693 and SS514493 Figure 4 1A) contain copper at level 2 concentrations One location (SS513893) contains copper at a level 1 concentration (26 8 mg/kg) but its concentration is only 0 73 mg/kg above the base of the level 1 concentration interval Metal COCs in surface soils are not greatly elevated in the IHSS 133 area

Data used to plot radionuclide COCs in surface soil (the three isotopes of uranium) are presented in Table 4 2 Figure 4 2D summarizes the extent of these COCs Fifteen surface soil sampling locations contain radionuclide COCs at level 1 activities Results from one location (SS515493 Figure 4 2D) are the only ones that exceed the $UTLs_{99/99}$ listed in TM11 (DOE 1995a) This location was sampled at the position of an elevated HPGe measurement (Section 2 2 2 3) With the exception of this sample data indicate that these constituents are fairly evenly distributed throughout the surface soil in the vicinity of IHSS 133

No organic COCs were detected in surface soils in the IHSS 133 area

#### 4 3 2 2 Subsurface Soil

Data used to plot metal COCs in IHSS 133 subsurface soil (antimony beryllium cadmium copper molybdenum nickel and silver) are presented in Table 4 4 These data are summarized on Figure 4-4D which shows the location of the boreholes Most boreholes that contain metals at level 1 concentrations contain waste materials as may be seen by inspection of borehole logs in Appendix B or they are near locations with waste materials in the subsurface Exceptions are boreholes 55193 58793 59093 and 55294 (Figure 4-4C) The presence of level 1 concentrations of metals at these locations is unexplained In borehole 55193 the concentration of copper exceeds level 1 in a sample taken at 6 to 8 feet in claystone just below the top of bedrock. Borehole 58793 is near the southern trench of IHSS 133 2 where no waste was found in the subsurface This borehole contained a level 1 concentration of antimony in gravelly sand just above bedrock at 18 to 24 feet Borehole 59093 contained antimony at a level 1 concentration in a sample from 0 to 6 feet in clayey sand Borehole 55294 is located at the position designated as TDEM 1 approximately 25 feet north of IHSS 133 6 A sample from gravelly sand at 12 to

15 2 feet immediately above bedrock contained a level 1 concentration of nickel Except for these four unexplained occurrences it appears that the lateral extent of level 1 concentrations of COC metal detects is consistent with the extent of waste materials

The vertical extent of explained occurrences of level 1 concentrations in IHSS 133 are consistent with the depth of waste materials However cadmium and copper were detected in borehole 56094 at 18 to 22 feet This borehole contained waste material but the depth of the waste was not recorded due to radioactivity hazard A sample from borehole 58093 contained cadmium at a level 1 concentration from a depth of 10 to 12 feet which was in the top of bedrock immediately beneath a waste interval All other occurrences of level 1 metals concentrations were from sample intervals that extended to shallower depths consistent with known depths of waste materials

Data used to plot radionuclide COCs in subsurface soil are presented in Table 4 5 and are summarized on Figure 4 5D These data indicate lateral and vertical extent similar to that of the metal COCs One difference is the level 1 activity of uranium 235 detected in borehole 64493 which lies within the magnetic anomaly west of IHSS 133 (Section 2 2 2 2) The presence of a level 1 activity of uranium 235 at this location is unexplained

Data used to plot organic COCs in subsurface soil are summarized in Table 4 6 These data are shown on Figure 4 6A No organic COCs were detected at IHSS 133 although only a very limited number of subsurface soil samples were collected for analysis of organic chemicals at IHSS 133

#### 4 3 2 3 Groundwater

Data used to plot metal COCs (aluminum, barium beryllium manganese and vanadium) dissolved in IHSS 133 groundwater are presented in Table 4 7 and are summarized on Figure 4 7A As shown on Figure 4 7A only manganese was detected at level 1 concentrations in the IHSS 133 area. Wells 58793 and 63793 are downgradient from the IHSS 133 2 ash pit. If the manganese in these wells is from waste in the ash pit to the north sampling data are insufficient to define the downgradient and lateral extent of the possible plume because no monitoring wells are located in downgradient and lateral positions however a plume may not exist Manganese in the IHSS 133 area is not closely associated with subsurface occurrences of waste and its occurrence at level 1 concentrations is unexplained It is noteworthy that manganese staining is described in samples from several boreholes in OU 5 including those in the IHSS 133 area, and manganese will coprecipitate with barium (Hem 1985) Results throughout OU 5 as summarized in Figure 4 7A suggest that barium is associated with manganese

Data used to plot radionuclide COCs dissolved in groundwater are presented in Table 4 8 and are summarized on Figure 4 8A No level 1 activities of radionuclides were detected in the IHSS 133 area. Radium was detected at a level 2 activities in well 58793 and may come from the IHSS 133 2 ash pit to the north

### 4 3 2 4 Surface Water

Distribution of COCs in IHSS 133 surface water is discussed in Section 4 3 3 1

### 4 3 2 5 Seep Water

Seep water was only sampled at two locations (wellpoints 62593 and 62693) in IHSS 133 (Figure 2 12) Neither location contained any of the COCs for seep water TM15 (DOE 1994a) contains a detailed discussion of results of these samples

### 4 3 2 6 Seep Sediments

Seep sediment samples were only sampled at the two IHSS 133 seep locations where seeps occure(Figure 2 12) TM15 (DOE 1994a) contains a detailed discussion of results of these samples Both locations contained zinc at a concentration exceeding the background $UTL_{99/99}$ Antimony exceeded the background $UTL_{99/99}$ in the sample from the seep near wellpoint 62693 (Figure 2 12) The sample from the sampling location near wellpoint 62593 (Figure 2 12) contained uranium 238 exceeding the background $UTL_{99/99}$

### 4 3 2 7 Stream Sediments

Distribution of COCs in IHSS 133 stream sediments is discussed in Section 4 3 3 3

### 4 3 3 IHSS 142 (C Series Ponds)

#### 4 3 3 1 Surface Water

No water samples were collected from the C Series ponds as part of the OU 5 RFI/RI Appendix A presents a discussion of historical surface water data for the ponds

Figure 4 9 shows that metal COCs for surface water (barium lithium and strontium) were not detected within OU 5 at concentrations exceeding the background mean however statistical analyses indicated that the distribution of these metals was sufficiently different from background to warrant their inclusion as COCs (DOE 1995a)

Data used to plot radionuclide COCs (americium 241 uranium 233/234 and uranium 238) in surface water are presented in Table 4 9 and are summarized on Figure 4 10 Americium 241 and uranium 238 were detected at a level 1 activities in the SID at SW027 north of Pond C 2

The sample from location SW50293 (Figure 4 10) flowing seep water contained americium 241 uranium 233/234 and uranium 238 at level 1 activities Americium 241 uranium 233 234 and uranium 238 were also detected at level 1 activities in the SID (SW507)

#### 4 3 3 2 Pond Sediments

The nature and extent of COCs in C Series pond sediments are discussed in Appendix A and TM15 (DOE 1994a) A summary for each pond is presented below

<u>IHSS 142.10 (Pond C 1)</u> Mercury was detected in samples from the three locations (inlet, mid point and deepest) at concentrations exceeding the background $UTL_{99/99}$ One sample had an activity of uranium 238 that exceeded the background $UTL_{99/99}$ This sample was obtained from the midpoint of Pond C 1

<u>IHSS 142.11 (Pond C 2)</u> Zinc was detected at concentrations exceeding the background $UTL_{99/99}$ in the samples from the midpoint and the deepest portion of Pond C 2 Radionuclide COCs were not detected at activities exceeding the background $UTL_{99/99}$

### 4 3 3 3 Stream Sediments

Data used to plot metal COCs (copper mercury and zinc) in stream sediments from Woman Creek and the SID are presented in Table 4 10 These data are summarized on Figure 4 11 No metal COCs were detected at level 1 or level 2 concentrations for samples collected along Woman Creek or its tributaries

Copper mercury and zinc were detected at level 1 concentrations in the sediment sample from the location in the SID at the southeast corner of IHSS 115

Data used to plot radionuclide COCs (americium 241 and plutonium 239/240) in stream sediments are presented in Table 4 11 and are summarized on Figure 4 12 There are no radionuclide COCs that were detected at activities exceeding even the background mean for samples collected along Woman Creek or its tributaries There are no radionuclide COCs that were detected at activities exceeding the background mean plus one standard deviation

### 4 3 3 4 Subsurface Soil

IHSS 142.10 (Pond C 1) In subsurface soils downgradient of Pond C 1 COCs were not detected at concentrations exceeding the background mean plus one standard deviation (Figure 4 4B)

IHSS 142.11 (Pond C 2) Cadmium was detected at a level 1 concentration in borehole 50292 east of Pond C 2 (Figure 4 4B) No other metal COCs were detected at concentrations exceeding level-4 for samples collected near Pond C 2 Radionuclide COCs were not detected at activities exceeding level 4 Organic COCs were not detected in subsurface soil samples at Pond C 2

### 4 3 3 5 Groundwater

Data used to plot metal COCs (aluminum barium, beryllium manganese and vanadium) dissolved in groundwater from Woman Creek are presented in Table 4 7 and are summarized on Figure 4 7B Data used to plot radionuclide COCs (americium 241 plutonium 239/240 radium 226 and the three isotopes of uranium) in groundwater from Woman Creek are presented in Table 4-8 and summarized on Figure 4 8B

Pond C 1 Downgradient of Pond C 1 no metal COCs dissolved were detected in groundwater at level 1 concentrations (Figure 4 7B) Dissolved barium and manganese were found at level 2 concentrations

Dissolved radium 226 in groundwater is the only radionuclide COC that has been detected exceeding level 3 activities in the wells downgradient of Pond C 1 No radionuclides were detected at level 1 activities

Pond C 2 Both wells below Pond C 2 have been dry since they were constructed therefore no groundwater samples have been collected from these wells

### 4 3 4 IHSS 209 and Other Surface Disturbances

Data used to plot COCs for the various media for IHSS 209 and the other surface disturbances are presented in Tables 4 1 through 4 6 and summarized on Figures 4 1A through 4 6B

Of the media sampled at IHSS 209 and the other surface disturbances (surface soil and subsurface soil) the following is a short list of the COCs detected at level 1 and level 2 concentrations

- A surface soil sample from location SS512493 in IHSS 209 (Figure 4 1B) contained mercury at level 1 concentration
- A subsurface soil sample obtained from 24 to 28 9 feet in borehole 57793 (Figure 4-4A) in the Surface Disturbance South of the Ash Pits contained a level 2 concentration of antimony
- A subsurface soil sample obtained from the surface to 2 feet in borehole 57793 (Figure 4 5A) contained a level 2 activity of uranium 235

These data suggest that COCs exceeding background are not present within IHSS 209 and the other surface disturbances with the possible exception of mercury in one surface soil sample at IHSS 209

### 4 3 5 Summary of COCs In and Around OU 5 IHSSs

#### 4 3 5 1 Summary of IHSS 115/196

At IHSS 155/196 elevated concentrations of the COCs in all media (surface soils subsurface soils and groundwater) tend to be located in areas where buried wastes are present and elevated concentrations in the subsurface soil tend to be limited to the same depths as waste materials However one surface soil sample located outside of the IHSS 115 boundary south of the central part of the landfill contained elevated mercury which was also detected at elevated concentrations in surface soil within IHSS 115 directly upslope Elevated activities of uranium in surface soil follow the same pattern with downslope occurrences between the IHSS boundary and Woman Creek The distribution of organic chemicals in surface soils is also similar but more restricted areally with all of the detects greater than the contract required reporting limits occurring within the boundary of the IHSS where concentrations are generally less than 100 times these reporting limits

The greatest concentrations of COCs in subsurface soil are within the IHSS 115 boundary and most of the greater concentrations are near IHSS 196 where much waste is buried A few occurrences of nickel and uranium 238 and 235 that are not closely associated with the wastes may be related to construction of the SID and other unknown causes

The metal COCs dissolved in groundwater are primarily manganese and barium which may be naturally occurring because considerable manganese staining is found on subsurface materials and barium tends to be associated with manganese No elevated metal COCs are unequivocally associated with the wastes However radium 226 dissolved in groundwater does appear to be associated with the waste in the central part of the landfill and to have migrated downgradient at low activities toward Woman Creek

**4 3.5 2 Summary of IHSS 133**

The occurrence of COCs in the IHSS 133 area is similar to that in IHSS 155/196 in that elevated concentrations tend to be in areas where buried wastes are present and tend to be limited to depths of wastes Metals in the surface soils are at lower concentrations than in IHSS 115 with copper dominating Again the uranium COCs in the surface soils tend to be elevated near waste sites and downslope from them. No organic COCs were detected in the IHSS 133 area. Elevated levels of metal and radionuclide COCs in subsurface soils are closely associated with the buried wastes However as in IHSS 115 copper and nickel in addition to uranium isotopes are more widely distributed than the waste Also in IHSS 115 manganese and barium are at elevated concentrations in groundwater though these two metals may be naturally occurring Radium 226 was detected at greater than two standard deviations above the background mean in a well downgradient from the ash pit in IHSS 133 2 suggesting the presence of a plume containing low activities of radium 226

### 4 3 5 3 Summary of IHSS 142

Elevated levels of COCs in the Pond C 1 and Pond C 2 appear to be confined to the pond sediments Mercury and uranium 238 concentrations were detected in Pond C 1 sediments and zinc concentrations exceeding the $UTL_{99/99}$ were found in Pond C 2 Dissolved radium 226 was detected in a monitoring well downgradient from Pond C 1 at levels greater than two standard deviations above the background mean Wells immediately downslope from Pond C 2 are dry

Elevated levels of COCs have been detected in surface water and sediments at a few locations in OU 5 In a sediment sample from the SID at the southeast corner of IHSS 115 copper mercury and zinc were detected at concentrations greater than three standard deviations above the background mean In Woman Creek north of Pond C 2 americium 241 and uranium 238 were detected at greater than three standard deviations above the background mean Other measurable concentrations/activities of COCs in surface water and stream sediments have been at relatively low levels

### 4 3 5 4 Summary of IHSS 209 and Surface Disturbances

The only detect of a COC at a concentration greater than three standard deviations above the background mean is for mercury in surface soil at a location in IHSS 209

# Table 4-1
## Summary of Metal COCs Exceeding Background Mean in Surface Soil

| IHSS | Sequence ID | Locatio | Sample No. | Constituen | Resul in mg/kg | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exceeds the Background Mean but is less than Background Mean plus one Standard Deviation | | | | | | | | | | | | |
| 115/196 | 2161124 | SS510593 | SS50056AS | COPPER | 16 1 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2206001 | SS507993 | SS50030AS | COPPER | 15 75 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2160900 | SS507293 | SS50023AS | COPPER | 15 7 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2224988 | SS510393 | SS50054AS | COPPER | 15 6 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2160984 | SS507593 | SS50026AS | COPPER | 15 5 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2161208 | SS510893 | SS50059AS | COPPER | 15 5 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2223606 | SS509293 | SS50043AS | COPPER | 15 4 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2075525 | SS506893 | SS50019AS | COPPER | 14 9 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2227179 | SS508093 | SS50031AS | COPPER | 14 7 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2160872 | SS507193 | SS50022AS | COPPER | 14 5 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2161096 | SS510193 | SS50052AS | COPPER | 14 5 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2160816 | SS506993 | SS50020AS | COPPER | 14 1 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2224966 | SS509793 | SS50048AS | COPPER | 13 8 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2225309 | SS509793 | SS50048AS | MERCURY | 0 1 | B | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2225315 | SS510393 | SS50054AS | MERCURY | 0 1 | B | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2223807 | SS509993 | SS50050AS | MERCURY | 0 09 | B | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2123597 | SS506493 | SS50015ASU5 | SILVER | 3 3 | | 2 | V | 2 8 | 4 84 | 6 88 | 8 92 |
| 133 2 | 2746484 | SS514993 | SS50112AS | COPPER | 15 6 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2650897 | SS514893 | SS50111AS | COPPER | 14 75 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2746462 | SS515193 | SS50114AS | COPPER | 14 3 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2746073 | SS514993 | SS50112AS | MERCURY | 0 1 | B | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| 133 4 | 2746116 | SS514093 | SS50102AS | COPPER | 15 9 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| 133.5 | 2744014 | SS513493 | SS50096AS | COPPER | 13 8 | | 5 | V | 13 41 | 17 63 | 21 85 | 26.07 |
| | 2746204 | SS514393 | SS50106AS | COPPER | 13 6 | | 5 | V | 13 41 | 17 63 | 21 85 | 26.07 |
| 209 | 2666874 | SS512493 | SS50083AS | COPPER | 14 2 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| S133 | 2569821 | SS513393 | SS50092AS | MERCURY | 0 1 | B | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| W209 | 2569263 | SS511793 | SS50076AS | COPPER | 17 3 | | 5 | V | 13 41 | 17 63 | 21 85 | 26.07 |
| | 2569329 | SS512193 | SS50080AS | COPPER | 17 | | 5 | V | 13 41 | 17 63 | 21.85 | 26 07 |
| | 2569307 | SS511993 | SS50078AS | COPPER | 16 4 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2569219 | SS511593 | SS50074AS | COPPER | 16 2 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2569285 | SS511893 | SS50077AS | COPPER | 16 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2569241 | SS511693 | SS50075AS | COPPER | 14 9 | | 5 | V | 13 41 | 17 63 | 21 85 | 26.07 |
| | 2666818 | SS512293 | SS50081AS | COPPER | 13 7 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2569743 | SS512193 | SS50080AS | MERCURY | 0 09 | B | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| Exceeds the Background Mean plus ne Standard Deviation but is less than Background Mean plus two Standard Deviations | | | | | | | | | | | | |
| 115/196 | 2160844 | SS507093 | SS50021AS | COPPER | 20 3 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2223628 | SS509893 | SS50049AS | COPPER | 20 3 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2161068 | SS509593 | SS50046AS | COPPER | 20 1 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2703339 | SS510293 | SS50053AS | COPPER | 19 1 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2206029 | SS508293 | SS50033AS | COPPER | 18 3 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2206253 | SS511293 | SS50063AS | COPPER | 17 7 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2225297 | SS508693 | SS50037AS | MERCURY | 0 12 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2225303 | SS509193 | SS50042AS | MERCURY | 0 12 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2703561 | SS510293 | SS50053AS | MERCURY | 0 12 | B | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| 133 3 | 2746006 | SS514493 | SS50107AS | MERCURY | 0 12 | | 0 1 | JA | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2746254 | SS514493 | SS50107AS | SILVER | 6 3 | | 2 | JA | 2 8 | 4 84 | 6 88 | 8 92 |
| 133.5 | 2744036 | SS513793 | SS50099AS | COPPER | 18 1 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| W209 | 2666790 | SS512093 | SS50079AS | COPPER | 18 1 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| Exceeds the Background Mean plus two Standard Deviations bu is less than Background Mea plus three Standard Deviations | | | | | | | | | | | | |
| 115/196 | 2223825 | SS509893 | SS50049AS | MERCURY | 0 17 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2161157 | SS510693 | SS50057AS | MERCURY | 0 16 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| 133 3 | 2746248 | SS514493 | SS50107AS | COPPER | 24 4 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2743970 | SS513693 | SS50098AS | COPPER | 23 9 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |

# Table 4-1 (Continued)

| IHSS | Sequence ID | Location | Sample No. | C nstituen | Result in mg/kg | Qualifie | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exceeds the Background Mean plus three Standard Deviations | | | | | | | | | | | | |
| 115/196 | 2224922 | SS508693 | SS50037AS | COPPER | 184 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2223562 | SS509993 | SS50050AS | COPPER | 139 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2227223 | SS510093 | SS50051AS | COPPER | 112 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2161152 | SS510693 | SS50057AS | COPPER | 78 2 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2223540 | SS509393 | SS50044AS | COPPER | 71 9 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2205973 | SS507893 | SS50029AS | COPPER | 68 3 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2227075 | SS508993 | SS50040AS | COPPER | 60 45 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2206113 | SS508893 | SS50039AS | COPPER | 58 8 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2227201 | SS509493 | SS50045AS | COPPER | 55 7 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2206085 | SS508493 | SS50035AS | COPPER | 45 2 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2224944 | SS509193 | SS50042AS | COPPER | 35 4 | | 5 | JA | 13 41 | 17 63 | 21 85 | 26.07 |
| | 2223584 | SS508793 | SS50038AS | COPPER | 33 5 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2223650 | SS510493 | SS50055AS | COPPER | 30 4 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2205945 | SS507793 | SS50028AS | COPPER | 27 6 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| | 2205978 | SS507893 | SS50029AS | MERCURY | 0 38 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2227372 | SS508093 | SS50031AS | MERCURY | 0 37 | | 0 1 | JA | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2227384 | SS510093 | SS50051AS | MERCURY | 0 34 | | 0 1 | JA | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2227378 | SS509493 | SS50045AS | MERCURY | 0 28 | | 0 1 | JA | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2703567 | SS509693 | SS50047AS | MERCURY | 0 26 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2227342 | SS508993 | SS50040AS | MERCURY | 0 255 | | 0 1 | JA | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2205950 | SS507793 | SS50028AS | MERCURY | 0 23 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2206118 | SS508893 | SS50039AS | MERCURY | 0 21 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2223801 | SS509393 | SS50044AS | MERCURY | 0 21 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| | 2223813 | SS508793 | SS50038AS | MERCURY | 0 195 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0.17 |
| | 2205982 | SS507893 | SS50029AS | SILVER | 94 3 | N | 2 | JA | 2 8 | 4 84 | 6 88 | 8 92 |
| | 2206038 | SS508293 | SS50033AS | SILVER | 12 6 | N | 2 | JA | 2 8 | 4 84 | 6 88 | 8 92 |
| 133.5 | 2744058 | SS513893 | SS50100AS | COPPER | 26 8 | | 5 | V | 13 41 | 17 63 | 21 85 | 26 07 |
| 209 | 2666879 | SS512493 | SS50083AS | MERCURY | 0 66 | | 0 1 | V | 0 08 | 0 11 | 0 14 | 0 17 |
| These data re graphically displayed Figures 4-7 ad 7b. | | | | | | | | | | | | |

# Table 4 2 Summary of Radıonuclide COCs Exceedıng Background Mean ın Surface Soil

| IHSS | Sequence ID | Location | Sample N | Constituen | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Exceeds the Background Mean bu | less than Background Mean plus one Standard Deviation | | | | | | | | |
| 5 96 | 367 442 | SS505 93 | SS50002AS | U233234 | | | 0364 | Y | 0.822 | .202 | .582 | 962 |
| | 3670873 | SS505593 | SS50006AS | U233234 | 1 126 | | 0.0287 | Y | 0.822 | 202 | .582 | 962 |
| | 367144 | S505793 | SS50008AS | U233234 | 1005 | | 0.0247 | Y | 0.822 | 202 | .582 | 1 962 |
| | 2269934 | SS51089 | SS50059AS | U233234 | 1 0919 | | 0.0341 | | 0.822 | .202 | 1.582 | 1 962 |
| | 2269942 | S 50989 | SS50049AS | 233234 | 0697 | | 03 6 | | 822 | 1.202 | .582 | 962 |
| | 2330946 | SS508593 | SS50036AS | U233234 | 1 04 | | 0.027 | A | 0.822 | 1 202 | 1.582 | 1 962 |
| | 2425847 | SS506293 | SS50013AS | U233234 | | | 1 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2425879 | SS507393 | SS50024AS | U233234 | 0.96 | | 0.2 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2330938 | SS508493 | SS50035AS | U233234 | 94 | | 0.0 6 | | 0.822 | 1.202 | 1.582 | 962 |
| | 2405921 | SS507093 | SS50021AS | U233234 | 0.934 | | 0.023 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 24059 8 | 507593 | SS50026AS | U233234 | 929 | | | A | 0.822 | .202 | 1.582 | 1 962 |
| | 2330932 | SS507993 | SS50030AS | U233234 | 0. 14 | | 0.019 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2330940 | SS508293 | SS50033AS | U233234 | 0.9 2 | | 017 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 367087 | SS505693 | SS50007AS | U233234 | 0.905 | | 0.0178 | Y | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2330930 | SS508993 | SS50040AS | U233234 | 0.896 | | 0.032 | | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2425839 | S506 | SS500 2AS | U23 234 | 0.89 | | 0.1 | | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2405909 | S508693 | SS50037AS | U233234 | 0.873 | | 0.031 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2330944 | SS509493 | SS50045AS | U233234 | 0.856 | | 019 | | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2425871 | SS506893 | SS50019AS | U233234 | 0.83 | | 0.1 | A | 0.822 | 1 202 | 1.582 | 1 962 |
| | 25895 | S 506993 | 50020AS | U23 234 | 0.83 | | | | 822 | 1.202 | .582 | 962 |
| | 3670894 | SS510293 | SS50053AS | U235 | 0.085 | | 0251 | Y | 0.039 | 0.091 | 0.143 | 0.195 |
| | 670895 | SS509693 | SS50047AS | U235 | 0.0826 | | 0.0265 | Y | 039 | 0.091 | 0.143 | 0. 95 |
| | 2330909 | SS508893 | SS50039AS | U235 | 0.0759 | | 0 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 25856 | SS506493 | SS50015AS | U235 | 07 | U | 0.2 | | 039 | 0.09 | 143 | 0.195 |
| | 2405868 | SS507193 | SS50022AS | U235 | 0 0739 | | 0 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3671464 | SS505893 | SS50009AS | U235 | 0.0724 | | 0.0205 | Y | 0.039 | 0.091 | 0. 43 | 195 |
| | 2425888 | SS507693 | SS50027AS | U235 | 0.072 | U | 0.2 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2330900 | SS509493 | SS50045AS | U235 | 0.0652 | | 0 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2269969 | SS511393 | SS50064AS | U235 | 0.0623 | | 0.0459 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3670903 | S 515293 | SS50126AS | U235 | 0.0557 | | 0.0273 | Y | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2405884 | SS507093 | SS50021AS | U235 | 0.0556 | | 0 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2269960 | SS508793 | SS50038AS | U235 | 05524 | | 0.0379 | A | 0.039 | 0.091 | 0. 43 | 0.195 |
| | 2425872 | SS506893 | SS50019AS | U235 | 0.052 | U | 0.1 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2270050 | SS50909 | SS5004 AS | U235 | 0.0503 | | 0618 | | 0.039 | 091 | 0. 43 | 0. 95 |
| | 2681789 | SS509093 | SS50041AS | U235 | 0.05 | | 0.06 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2330903 | 50829 | SS50033AS | U235 | 049 | | | | 039 | 09 | 43 | 95 |
| | 2269958 | SS509393 | SS50044AS | U235 | 0.0482 | | 0.0973 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2425880 | SS507393 | SS50024AS | U235 | 048 | U | 0.2 | A | 039 | 0.091 | 0.143 | 0.195 |
| | 367 462 | SS505993 | SS50010AS | U235 | 0.04705 | | 0297 | Y | 0.039 | 0.091 | 0.143 | 0. 95 |
| | 2425848 | S 506293 | SS50013AS | U235 | 0.047 | U | 0.2 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2330896 | SS508993 | SS50040AS | U235 | 0.0459 | | 0.023 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2425832 | S 50609 | SS500 1AS | U235 | 0.045 | | 0.1 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2330902 | SS507993 | SS50030AS | U235 | 0.0448 | | 0 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2330905 | SS508393 | SS50034AS | U235 | 0.0442 | | 0 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2405870 | SS507493 | SS50025AS | U235 | 0.0413 | | 0 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2425840 | SS506193 | S50012AS | U235 | 04 | U | 0.2 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3670897 | SS505593 | SS50006AS | U235 | 0.0399 | | 0.0196 | Y | 0.039 | 0.091 | 0.143 | 195 |
| | 3670901 | SS515293 | SS50124AS | U235 | 0.0391 | | 0.0222 | Y | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3671479 | SS505793 | SS50008AS | U238 | 1 0632 | | 0.0196 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2330966 | SS508593 | SS50036AS | U238 | 1 02 | | 0.027 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3670922 | SS505693 | SS50007AS | U238 | 0.9608 | | 0.0179 | Y | 0.733 | 146 | 1.559 | 1 972 |
| | 2330951 | SS508393 | SS50034AS | U238 | 0.954 | | 0.018 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2405935 | SS507593 | SS50026AS | U238 | 0.95 | | 0.021 | | 0.733 | 1 146 | 1.559 | 972 |
| | 2425889 | SS507693 | SS50027AS | U238 | 0.93 | | 0.2 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2269978 | SS5 0593 | SS50056AS | U238 | 98 | | 03 5 | | 0.733 | 146 | .559 | 972 |
| | 2425857 | SS506493 | SS50015AS | U238 | 9 | | 0.2 | A | 0.733 | 146 | 1.559 | 1 972 |
| | 2405937 | SS509193 | SS50042AS | U238 | 0.874 | | 0.02 | A | 0. 33 | 1 146 | .559 | 1 972 |
| | 2425849 | SS506293 | SS50013AS | U238 | 0.87 | | 0.1 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 226997 | SS510893 | SS50059AS | U238 | 0.8699 | | 0.034 | | 0.733 | 46 | 1.559 | 972 |
| | 2425873 | SS506893 | SS50019AS | U238 | 0.85 | | 0.1 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2330954 | SS507993 | SS50030AS | U238 | 0.843 | | 0 | A | 0.733 | 146 | 1.559 | 972 |
| | 2425897 | SS506993 | SS50020AS | U238 | 0.84 | | 0.1 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2330952 | SS508293 | SS50033AS | U238 | 0.821 | | 0.017 | A | 733 | 1 146 | 1.559 | 972 |
| | 2425841 | SS506193 | SS50012AS | U238 | 0.82 | | 0.1 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2405936 | 509793 | SS50048AS | U238 | 98 | | 033 | | 0.733 | 1 146 | .559 | 1 972 |
| | 2425881 | SS507393 | SS50024AS | U238 | 0.79 | | 0.2 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 226998 | SS5 04 | SS50055AS | U238 | 7779 | | 0425 | | 733 | 46 | .559 | 972 |
| | 2405922 | SS507193 | SS50022AS | U238 | 0.76 | | 0.022 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 24258 | 50609 | SS500 AS | U238 | | | | | 733 | 46 | .559 | 972 |
| | 2405925 | SS510393 | SS50054AS | U238 | 0. 49 | | 0.019 | A | 0.733 | 1 146 | 1.559 | 972 |
| | 2330955 | 5077 | SS50028AS | U238 | 44 | | 022 | | 73 | 46 | 1.559 | 972 |
| | 2269989 | S511293 | SS50063AS | U238 | 402 | | 0359 | | 0.733 | 1 146 | .559 | 1 972 |
| 33 | 689692 | 5 3 | S50 03AS | U235 | 0.062 | BJ | 0. 1 | | 0.039 | 091 | 0.143 | 0.195 |
| 33.2 | 2689762 | SS514993 | S50112AS | U235 | 0.089 | BJ | 012 | | 039 | 091 | 1 3 | 0. 95 |
| | 3670899 | SS 489 | S50 AS | U235 | 04895 | | 027 | Y | 0.039 | 091 | 3 | 0.195 |

## Table 4-2 (Contnued)

| IHSS | Seq ence ID | Location | Sample No. | Constituent | Result in PCI/G | Qualifier | Reporting Limit | alid. | Mean (X STD DEV) of background M an | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33.3 | 2689720 | SS514493 | SS50107AS | U235 | 0.087 | BJ | 0.025 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| 133.4 | 2642367 | SS51399 | SS50101AS | U235 | 0.045 | | 13 | | 0.039 | 0.09 | 43 | 95 |
| 33.5 | 2642339 | SS5 349 | SS50096AS | U235 | 054 | | 0.011 | | 0.039 | 0.091 | 0.143 | 95 |
| | 2642346 | SS513793 | SS50099AS | U235 | 048 | J | 0.038 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| 33.6 | 26423 | SS5 3593 | SS50097AS | U235 | 044 | | 0.021 | | 0.039 | 0.091 | 43 | 95 |
| 209 | 2732828 | SS512493 | SS50083AS | U233234 | 1 07 | | 0.037 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2732799 | SS512493 | SS50083AS | U235 | 0494 | | 0 3 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2732851 | SS512493 | SS50083AS | U238 | 1 08 | | 0.031 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| S133 | 2725 84 | SS5 309 | 50089AS | U233234 | 836 | | 035 | | 0.822 | .202 | .582 | 1 962 |
| | 2725149 | SS512993 | SS50093AS | U235 | 0.05255 | | 0.036 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2725 98 | SS5 3093 | SS50089AS | U238 | 0.873 | | 035 | | 0.733 | 146 | .559 | 972 |
| W209 | 2732824 | SS511993 | SS50078AS | U233234 | 0.965 | | 0.032 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2725180 | SS512193 | S50080AS | U233234 | 0.926 | | 0.034 | A | 0.822 | 1.202 | .582 | 1 962 |
| | 2732831 | SS512093 | SS50079AS | U233234 | 0.892 | | 0.046 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2732805 | SS511993 | SS50078AS | U235 | 0.0573 | | 0.016 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2732804 | SS5 2093 | SS50079AS | U235 | 0563 | | 037 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2732794 | SS511593 | SS50074AS | U235 | 0.046 | | 0.016 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2732795 | SS51169 | SS50075AS | U235 | 046 | | 0.0 5 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2732841 | SS511993 | SS50078AS | U238 | 1 03 | | 0.026 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2732845 | SS511593 | SS50074AS | U238 | 3 | | 0.013 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2732842 | SS511893 | SS50077AS | U238 | 0.875 | | 0.031 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2725205 | S5 2193 | SS50080AS | U238 | 0.869 | | 03 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2732843 | SS511 93 | SS50076AS | U238 | 0.842 | | 011 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2732854 | SS5 2093 | SS50079AS | U238 | 0.827 | | 0.04 | | 0.733 | 146 | 1.559 | 1 972 |
| | 2732853 | SS512293 | SS50081AS | U238 | 0.807 | | 0.03 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| **Exceeds the Background Mean plus one Standard Deviation but less than Background Mean plus two Standard Deviations** | | | | | | | | | | | | |
| 15/196 | 2330943 | SS510093 | SS50051AS | U233234 | 1.55 | | 0.023 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2330945 | S50809 | SS5003 AS | U233234 | 46 | | 0.026 | | 0.822 | .202 | 1.582 | 1 962 |
| | 3670878 | SS515293 | SS50125AS | U233234 | 1.3237 | | 0.0302 | Y | 0.822 | 1.202 | 1.582 | 1 962 |
| | 3670879 | SS515293 | SS50126AS | U233234 | 1.2839 | | 0.04 | Y | 0.822 | 1 202 | 1.582 | 1 962 |
| | 3670877 | SS515293 | SS50124AS | U233234 | 1.2634 | | 0.0361 | Y | 0.822 | 1.202 | 1.582 | 1 962 |
| | 3671443 | SS505993 | SS50010AS | U23 234 | .21295 | | 0342 | Y | 0.822 | .202 | .582 | 1 962 |
| | 2330912 | SS51009 | SS50051AS | U235 | 0.124 | | 0 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2330904 | SS508493 | SS50035AS | U235 | 0.11 | | 0.016 | A | 0.039 | 091 | 0.143 | 0.195 |
| | 2425912 | SS508193 | SS50032AS | U235 | 0.11 | U | 0.2 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3670925 | 29 | SS50 24AS | U238 | 22 | | 0222 | | 73 | 46 | 59 | .972 |
| | 2330965 | SS508093 | SS50031AS | U238 | .54 | | 0.019 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2330964 | SS508493 | SS50035AS | U238 | 1.35 | | 0.016 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2405931 | SS507493 | SS50025AS | U238 | 1.31 | | 0.029 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 367 481 | SS505993 | SS50010AS | U238 | 1.24775 | | 0.0234 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3670927 | SS515293 | SS50126AS | U238 | .2394 | | 0.0273 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| | 240594 | SS507093 | SS50021AS | U238 | 1 18 | | 0 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2269982 | SS509293 | SS50043AS | U238 | 1 1761 | | 0.0323 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| 133.2 | 2689763 | SS514993 | SS50112AS | U233234 | 1.5 | B | 0.012 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2689748 | SS515093 | SS50113AS | U235 | 0.13 | BJ | 0.023 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2689755 | SS515193 | SS50114AS | U235 | 0.099 | BJ | 0.021 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| 33.3 | 2689742 | SS5 4793 | SS50110AS | U233234 | | B | 0.049 | | 0.822 | .202 | 1.582 | 1 962 |
| 133.4 | 2642361 | SS514093 | SS50102AS | U233234 | 1.5 | B | 0.033 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2642368 | SS513993 | SS50101AS | U233234 | 1.5 | B | 0.033 | | 0.822 | 1.202 | 1.582 | 1 962 |
| 133.5 | 2642353 | SS513893 | SS50100AS | U235 | 0.11 | J | 0.022 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2642338 | SS513493 | SS50096AS | U238 | 1.3 | B | 03 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| 133.6 | 2642325 | SS513693 | SS50098AS | U235 | 0.11 | J | 0.031 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| **Exceeds the Background Mean plus two Standard Deviations bu less than Background Mean plus three Standard Deviations** | | | | | | | | | | | | |
| 115/196 | 2269937 | SS509393 | SS50044AS | U233234 | 1 7913 | | 0.1149 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2330963 | SS508893 | SS50039AS | U238 | 92 | | 0.01 | | 0.733 | 1 146 | .559 | 972 |
| | 2330947 | SS508993 | SS50040AS | U238 | 1 77 | | 032 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3671480 | SS505193 | SS50002AS | U238 | .5753 | | 0.0223 | Y | 0.733 | 1 146 | .559 | 1 972 |
| | 3670926 | S515293 | SS50125AS | U238 | .5696 | | 0.0302 | Y | 0.733 | 1 146 | 1.559 | 972 |
| 33.1 | 2689728 | SS514593 | SS50108AS | U233234 | 1.8 | B | 0.019 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2689693 | SS5 | SS50103AS | U233234 | | B | 0 | | 0.822 | .202 | .582 | 962 |
| | 2689691 | SS51 193 | SS50103AS | U238 | 1 6 | B | 0.017 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| 33.2 | 3670875 | SS514893 | SS501 AS | U23 234 | 1 6469 | | 0273 | Y | 0.822 | .202 | 1.582 | 1 962 |
| | 2689749 | SS515093 | SS50113AS | U233234 | 1.6 | B | 0.01 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 3670923 | SS514893 | SS50111AS | U238 | 1 96495 | | 0.0274 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| 33.3 | 2689735 | SS514693 | SS50109AS | U233234 | 1 6 | B | 0.036 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 26897 | SS5147 3 | SS50110AS | U235 | 0. 9 | BJ | 0.027 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2689734 | SS514693 | SS50109AS | U235 | 17 | BJ | 0.014 | | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2689740 | SS514793 | SS50110AS | U238 | 1.8 | B | 0.049 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| 33 | 2642360 | 514093 | SS50102AS | U235 | 0.15 | J | 0.021 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| 33.5 | 2642354 | SS513893 | SS50100AS | U233234 | 1 8 | B | 0.052 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2689700 | 29 | 50 04AS | U23 234 | | | | | 822 | .202 | .582 | 962 |
| | 2689706 | 439 | 50 06AS | U235 | 635 | BJ | | | 039 | 09 | 43 | 95 |
| | 2689699 | SS514293 | SS50104AS | U235 | 5 | BJ | 0.011 | | 0.039 | 0.091 | 0.143 | 0.195 |

# Table 4 2 (Continued)

| IHSS | Seq ence ID | Location | Sample No. | Constituent | Result in PCI/G | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33.6 | 2642326 | SS513693 | SS50098AS | U233234 | 1 6 | B | 0.041 | | 0.822 | 1.202 | 1.582 | 1 962 |
| **Exceeds the Background Mean plus three Standard Deviations** | | | | | | | | | | | | |
| 15/196 | 9245 | SS505493 | SS50005AS | U233234 | 2800 | | 70 | V | 0.822 | 1.202 | .582 | 962 |
| | 3419233 | SS505093 | SS50001AS | U233234 | 200 | | 9 | V | 0.822 | 1.202 | 1.582 | 1 962 |
| | 34 9239 | SS505293 | SS50003AS | U233234 | 97 | | 5 | V | 0.822 | .202 | .582 | 1 962 |
| | 3419251 | SS515593 | SS50127AS | U233234 | 94 | | 6 | V | 0.822 | 1.202 | 1.582 | 1 962 |
| | 9257 | SS515693 | SS50128AS | U23 234 | | | 0.8 | V | 0.822 | 1 202 | 1.582 | 1 962 |
| | 3670870 | SS510293 | SS50053AS | U233234 | 3 637 | | 0.0446 | Y | 0.822 | 1.202 | 1.582 | 1 962 |
| | 3670872 | SS505393 | SS50004AS | U233234 | 2.707 | | 0 75 | Y | 0.822 | 1 202 | .582 | 1 962 |
| | 2269938 | SS509993 | SS50050AS | U233234 | 2.6707 | | 0.049 | | 0.822 | 1.202 | 1.582 | 1 962 |
| | 367087 | SS509693 | SS50047AS | U23 234 | 392 | | 0.0432 | Y | 0.822 | .202 | 1.582 | 962 |
| | 3671445 | SS505893 | SS50009AS | U233234 | 2.3131 | | 0.0258 | Y | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2269939 | SS508793 | SS50038AS | U233234 | 2.26 5 | | 0.0619 | A | 0.822 | 202 | 1.582 | 1 962 |
| | 3419246 | SS505493 | SS50005AS | U235 | 670 | | 30 | V | 0.039 | 0.091 | 0.143 | 0.195 |
| | 34 9234 | SS505093 | SS5000 AS | U235 | 46 | | 6 | V | 0.039 | 0.091 | 0.143 | 0.195 |
| | 34 9240 | SS505293 | SS50003AS | U235 | 23 | | 3 | V | 0.039 | 0.091 | 0.143 | 0.195 |
| | 34 9252 | SS5 5593 | SS50127AS | U235 | 9 | | | V | 039 | 0.091 | 0. 43 | 0.195 |
| | 3419258 | SS515693 | SS50128AS | U235 | 2.1 | | 0.5 | V | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3670896 | SS505393 | SS50004AS | U235 | 0.2739 | | 0.0176 | Y | 0.039 | 0.091 | 0.143 | 0.195 |
| | 2269959 | SS509993 | SS50050AS | U235 | 0.2283 | | 0.0301 | A | 0.039 | 0.091 | 0.143 | 0.195 |
| | 9247 | SS505493 | SS50005AS | U238 | 38000 | | 70 | V | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3419235 | SS505093 | SS50001AS | U238 | 2000 | | 9 | V | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3 19241 | SS505293 | SS50003AS | U238 | 000 | | | V | 0.733 | 1 146 | 1 559 | 1 972 |
| | 9253 | S5 5593 | SS50127AS | U238 | 780 | | 5 | V | 0.733 | 146 | 1.559 | 1 972 |
| | 34 9259 | SS515693 | SS50128AS | U238 | 86 | | | | 0.733 | 1 146 | .559 | 1 972 |
| | 2269980 | SS509993 | SS50050AS | U238 | 1 7287 | | 0.0576 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3670920 | SS505393 | SS50004AS | U238 | 10.0269 | | 0222 | Y | 0.733 | 1 146 | .559 | 1 972 |
| | 2269979 | SS509393 | SS50044AS | U238 | 7 7302 | | 0.0829 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2330957 | SS5 0093 | SS50051AS | U238 | 5 43 | | 0 | A | 0.733 | 46 | 1.559 | 1 972 |
| | 2269981 | SS508793 | SS50038AS | U238 | 3 6463 | | 0.0379 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3670918 | SS510293 | SS50053AS | U238 | 3.3073 | | 0.0251 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2269984 | SS509893 | SS50049AS | U238 | 2.3629 | | 0.0317 | A | 0.733 | 1 146 | 1.559 | 972 |
| | 36709 9 | SS509693 | SS50047AS | U238 | 2.2344 | | 0.0265 | Y | 0.733 | 146 | 1.559 | 1 972 |
| | 2330958 | SS509493 | SS50045AS | U238 | 2. | | 0.019 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2269977 | SS510693 | SS50057AS | U238 | 2.037 | | 0.0399 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3670921 | SS505593 | SS50006AS | U238 | 2.0258 | | 0.0196 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3671483 | SS505893 | SS50009AS | U238 | 1 98 | | 0205 | | 73 | 46 | 59 | 972 |
| 133 | 2689726 | SS514593 | SS50108AS | U238 | 2 | B | 0.05 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| 133.2 | 2689756 | SS515193 | SS50114AS | U233234 | 2.2 | B | 0.021 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2689754 | SS515193 | SS50114AS | U238 | 2.6 | B | 0.021 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2689761 | SS514993 | SS50112AS | U238 | 2.3 | B | 0.021 | A | 0.733 | 1 146 | 1 559 | 1 972 |
| | 2689747 | SS515093 | SS50113AS | U238 | 2.1 | B | 0.023 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| 133.3 | 2689721 | SS514493 | SS50107AS | U233234 | 3.3 | B | 0.015 | A | 0.822 | .202 | 1.582 | 1 962 |
| | 2689719 | SS514493 | SS50107AS | U238 | 5.2 | B | 0.039 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2689733 | SS514693 | SS50109AS | U238 | 2.8 | B | 0.036 | A | 0.733 | 146 | 1.559 | 1 972 |
| 133.4 | 3670881 | SS5 5493 | SS50121AS | U233234 | 47 4833 | | 0.073 | Y | 0.822 | .202 | 1.582 | 1 962 |
| | 3670882 | SS515493 | SS50122AS | U233234 | 44.9751 | | 0.0933 | Y | 0.822 | 1 202 | 1.582 | 1 962 |
| | 3670883 | SS515493 | SS50123AS | U233234 | 3 2646 | | 0.1066 | Y | 0.822 | 1.202 | .582 | 1 962 |
| | 3670906 | SS515493 | SS50122AS | U235 | 2.8877 | | 0.1366 | Y | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3670905 | SS515493 | SS50121AS | U235 | 2.2385 | | 0.073 | Y | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3670907 | SS515493 | SS50123AS | U235 | 2. 994 | | 0.1066 | Y | 0.039 | 0.091 | 0.143 | 0.195 |
| | 3670929 | SS515493 | SS50121AS | U238 | 209.2773 | | 0.0921 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| | 3670930 | SS515493 | SS50122AS | U238 | 203.0783 | | 0.0933 | Y | 0.733 | 1 146 | 1.559 | 1 972 |
| | 367093 | SS515493 | SS50123AS | U238 | 90.3 | | 066 | Y | 0.733 | 46 | 1.559 | 972 |
| | 2642359 | SS514093 | SS50102AS | U238 | 2.6 | B | 0.038 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2642366 | SS513993 | SS50101AS | U238 | 2.2 | B | 0.033 | A | 0.733 | 1 146 | .559 | 972 |
| 33.5 | 2689707 | SS514393 | SS50106AS | U233234 | 2.6 | B | 0.012 | | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2642347 | SS513793 | SS50099AS | U233234 | 2. | B | 0.014 | | 0.822 | 1 202 | 1.582 | 1 962 |
| | 2689705 | SS514393 | SS50106AS | U238 | 1 | B | 0.012 | | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2642345 | SS513793 | SS50099AS | U238 | 3.5 | B | 0.014 | | 0.733 | 1 146 | .559 | 1 972 |
| | 2642352 | SS513893 | SS50100AS | U238 | 3. | B | 0.068 | | 0.733 | 1 46 | 1.559 | 1 972 |
| | 2689698 | SS514293 | SS50104AS | U238 | 2.5 | B | 0.019 | | 0.733 | 1 146 | .559 | 1 972 |
| 133.6 | 2642333 | SS513593 | SS50097AS | U233234 | 2. | B | 0.021 | A | 0.822 | 1.202 | 1.582 | 1 962 |
| | 2642331 | SS513593 | SS50097AS | U238 | 2.5 | B | 0.039 | A | 0.733 | 1 146 | 1.559 | 1 972 |
| | 2642324 | SS513693 | SS50098AS | U238 | 2.3 | B | 0.06 | A | 0.733 | 1 146 | 1.559 | 1 972 |

**These data are graphically displayed on Figures 4 2a and 2b**

# Table 4 3 Summary of Organic COCs in Surface Soil

| IHSS | Sequence ID | Location | Sample No. | Test roup Code | onstituent | Result in ug/kg | Qualifier | Reporting Limit | Vd |
|---|---|---|---|---|---|---|---|---|---|
| Dectected concentration below Reporting Limit | | | | | | | | | |
| 15/196 | 22646 | SS50999 | SS50050AS | BNACLP | Benzo(a)anthracene | 320 | | 330 | |
| | 2203934 | SS507993 | S50030AS | BNACLP | Benzo(a)anthracene | 90 | | 330 | |
| | 2265850 | S50999 | SS50050A | NACLP | Benzo(a)anthracene | 80 | | 330 | |
| | 22 84 | SS508693 | S500 | ACLP | Benzo(a)anthracene | 40 | | 330 | |
| | 2266034 | 50929 | 50043A | BNACLP | Benzo(a)anthracene | | | 330 | |
| | 224 60 | 5094 | SS50045AS | ACLP | Benzo(a)anthracene | 00 | | 30 | |
| | 2247252 | SS5 0093 | SS50051AS | BNACLP | Benzo(a)anthracene | 200 | | 30 | |
| | 2 5867 | SS508 | S50032AS | BNACLP | Benzo(a)anthracene | 1 | | 330 | |
| | 220408 | 5084 | S50035 | BNACLP | Benzo(a)anthracene | | | 330 | |
| | 2204473 | SS5 39 | S50064A | BNACLP | Benzo(a)anthracene | 60 | | 30 | |
| | 22662 8 | SS 04 | SS50055A | BNACLP | Benzo(a)anthracene | 60 | | 30 | |
| | 5833 | 507 3 | SS50022AS | BNCLP | Benzo(a)anthracene | 50 | J | 30 | |
| | 2204326 | 51 093 | SS50061A | BNACLP | Benzo(a)anthracene | 0 | JX | 330 | |
| | 2204228 | SS509093 | SS50041AS | BNACLP | Benzo(a)anthracene | 83 | | 30 | |
| | 70164 | 50969 | SS50047 S | BNACLP | Benzo(a)anthracene | 66 | | 330 | |
| | 2247068 | SS508093 | SS50031AS | BNACLP | Benzo(a)anthracene | 64 | | 330 | |
| | 224 66 | SS509493 | SS50045A | BNACLP | Benzo(a)Pyrene | 240 | | 330 | |
| | 2247258 | 0093 | SS500 1A | BNACLP | Benzo(a)Pyrene | 240 | | 330 | |
| | 2266040 | S50929 | SS50043AS | BNACLP | Benzo(a)Pyrene | 240 | | 330 | |
| | 58680 | S508 93 | SS50032A | BNACLP | Benzo(a)Pyrene | 80 | | 30 | |
| | 223 85 | S508693 | SS500 A | BNACLP | Benzo(a)Pyrene | 60 | | 330 | |
| | 2204479 | 39 | SS50064A | BNACLP | Benzo(a)Pyrene | 50 | | 30 | |
| | 2266224 | SS5 04 | SS50055AS | BNACLP | Benzo(a)Pyrene | 50 | | 30 | |
| | 2246656 | 508993 | SS50040A | BNACLP | Benzo( )Pyrene | 02 | | 30 | |
| | 224707 | SS50809 | SS5003 AS | BNACLP | Benzo(a)Pyrene | 7 | | 30 | |
| | 58678 | 508 | SS50032A | ACLP | Benzo(b)Fluoranthene | 32 | | 30 | |
| | 223 53 | 508693 | SS5003 | ACLP | Benzo(b)Fluoranthene | | | 30 | |
| | 2247 64 | 5094 | SS50045A | BNACLP | Benzo(b)Fluoranthene | 32 | J | 30 | |
| | 2266222 | S5 04 | SS5005 AS | BNACLP | Benzo(b)Fluoranthene | 300 | | 330 | |
| | 2204477 | SS5 39 | SS50064 S | BNACLP | Benzo(b)Fluoranthene | 220 | JX | 330 | |
| | 2204085 | S508493 | SS50035AS | BNACLP | Benzo(b)Fluoranthene | 200 | | 330 | |
| | 2247256 | 0093 | SS500 1A | BNACLP | Benzo(b)Fluoranthene | 130 | | 330 | |
| | 2247072 | SS50809 | SS50031AS | BNACLP | Benzo(b)Fluoranthene | 110 | | 330 | |
| | 2246654 | SS508993 | SS50040AS | BNACLP | Benzo(b)Fluoranthene | 03.5 | J | 30 | |
| | 2 5843 | SS507393 | SS50024 | BNACLP | Benzo(b)Fluoranthene | 87 | | 330 | |
| | 2265950 | 50879 | SS50038A | BNACLP | Dibenzo(a,h)anthracene | 35 | | 30 | |
| | 2265766 | S509393 | SS50044A | BNACLP | Dibenzo(a,h)anthracene | 69 | | 30 | |
| | 2265858 | SS509993 | SS50050AS | BNACLP | Dibenzo(a,h)anthracene | 60 | | 330 | |
| | 2246646 | SS508993 | SS50040A | BNACLP | Fluoranthene | 250 | | 30 | |
| | 2204322 | SS511093 | SS50061AS | BNACLP | Fluoranthene | 230 | J | 330 | A |
| | 2247064 | SS50809 | SS50031A | BNACLP | Fluoranthene | 2 0 | J | 330 | |
| | 2204224 | SS509093 | SS5004 S | BNACLP | Fluoranthene | 80 | | 330 | |
| | 70 63 | S509693 | SS5004 | BNACLP | Fluoranthene | 80 | | 330 | |
| | 58278 | SS507093 | SS50021AS | BNCLP | Fluoranthene | 50 | | 30 | |
| | 2204 | SS5 3 | SS5006 | NACLP | Fluoranthene | 50 | | 330 | |
| | 58180 | SS506693 | SS500 | BNCLP | Fluoranthene | 30 | | 30 | |
| | 5822 | S506993 | SS50020A | BNACLP | Fluoranthene | 30 | J | 330 | |
| | 2 584 | S507393 | SS50024A | BNACLP | Fluoranthene | | J | 330 | |
| | 2 546 | S 02 | SS50053A | BNACLP | Fluoranthene | | | 30 | |
| | 5862 | S50769 | SS50027 | BNACLP | Fluoranthene | | | 330 | |
| | 2246972 | SS508593 | SS50036A | BNACLP | Fluoranthene | | | 30 | |
| | 58572 | SS507593 | SS50026AS | BNCLP | Fluoranthene | 97 | | 330 | |
| | 2232209 | SS5 0393 | SS50054AS | BNACLP | Fluoranthene | 83 | | 30 | |
| | 2122 70 | SS506193 | SS50012ASU | BNACLP | Fluoranthene | 68 | J | 330 | |
| | 2265857 | SS509993 | SS50050AS | BNACLP | Indeno( ,2,3-cd)Pyrene | 250 | J | 330 | |
| | 2265765 | SS509393 | SS50044AS | BNACLP | Indeno(1,2,3-cd)Pyrene | 240 | | 330 | |
| | 226461 | 509993 | SS50050A | BNACLP | Indeno( ,2,3-cd)Pyrene | 230 | | 330 | |
| | 2266133 | SS509893 | SS50049AS | BNACLP | Indeno( ,2,3-cd)Pyrene | 2 | J | 330 | A |
| | 122365 | SS5064 | SS500 5ASU | BNACLP | deno( ,2,3-cd)Pyrene | 70 | | 330 | |
| | 224 67 | SS5094 | SS50045AS | BNACLP | Indeno( ,2,3-cd)Pyrene | 40 | J | 330 | |
| | 226604 | SS509293 | SS50043A | BNACLP | Indeno( ,2,3-cd)Pyrene | 30 | | 330 | |
| | 2247259 | SS510093 | SS50051AS | BNACLP | Indeno(1,2,3-cd)Pyrene | 120 | J | 330 | A |
| | 2266225 | 04 | SS50055A | BNACLP | Indeno( ,2,3-cd)Pyrene | 82 | J | 330 | |
| | 224665 | SS508993 | SS50040A | BNACLP | Indeno( ,2,3-cd)Pyrene | 59 | | 30 | A |
| | 224 07 | SS508093 | SS50031A | BNACLP | Indeno( ,2,3-cd)Pyrene | 52 | J | 330 | A |
| | 2 58328 | 507 | SS50022A | BNCLP | Pyrene | 280 | | 30 | A |
| | 2 5872 | 509593 | SS50046A | BNCLP | Pyrene | 280 | J | 330 | A |
| | 220407 | SS508493 | SS50035A | BNACLP | Pyrene | 270 | | 30 | |
| | 2204323 | SS511093 | SS50061AS | BNACLP | Pyrene | 00 | | 330 | A |
| | 224664 | S508993 | 50040AS | BNACLP | Pyrene | | | 30 | |
| | 2204225 | SS509093 | SS5004 S | BNACLP | Pyrene | 70 | J | 30 | |
| | 638 | 50969 | SS5004 | BNACLP | Pyrene | | | 30 | |
| | 58279 | SS507093 | SS50021A | NCLP | Pyrene | 50 | J | 330 | |
| | 224706 | S508093 | SS500 1A | BNACLP | Pyrene | 40 | | 30 | A |
| | 2204 | S5 3 | SS50065AS | BNACLP | Pyrene | 30 | | 330 | A |
| | 58230 | 506993 | S50020A | BNACLP | Pyrene | | | 330 | A |
| | 58 | SS50669 | S500 | BNCLP | Pyrene | | | 30 | |
| | 58573 | SS50759 | SS50026A | NCLP | Pyrene | | | 30 | |
| | 22322 | S5 39 | SS50054AS | BNACLP | Pyrene | 00 | | 30 | |
| | 58622 | SS507693 | SS5002 | BNACLP | Pyrene | 90 | | 330 | |
| | 54 | 02 | SS500 3A | BNACLP | Pyrene | | | 30 | |
| | 2 58426 | S507393 | 50024 | NACLP | Pyrene | | J | 330 | |
| | 1221 1 | 506 93 | SS50012ASU5 | BNACLP | Pyrene | | BJ | 30 | |

## Table 4 3 (Continued)

| IHSS | Sequence ID | Location | Sample N | set roup Code | Constituent | Result in ug/kg | Qualifier | Reporting Limit | alid. |
|---|---|---|---|---|---|---|---|---|---|
| | 2246973 | 508593 | SS50036AS | BNACLP | Pyrene | 59 | | 30 | |
| | | | Exceeds Reporting Limit but | less than ten times the Reporting Limit | | | | | |
| 15/196 | 223 31 | S509 | SS50042AS | BNACLP | Benzo(a)anthracene | 3000 | | 30 | |
| | 223 39 | 509 93 | SS50042AS | BNACLP | Benzo(a)anthracene | 900 | | 30 | |
| | 223212 | 509793 | 50048A | BNACLP | Benzo(a)anthracene | 500 | | 30 | |
| | 22 3836 | S507793 | SS50028AS | NACLP | Benzo(a)anthracene | 300 | | 330 | |
| | 22 3885 | S50789 | SS50029 | NACLP | Benzo(a)anthracene | 800 | | 30 | |
| | 22 5942 | SS50879 | SS50038A | BNACLP | Benzo(a)anthracene | 800 | | 330 | V |
| | 5887 | 0693 | S50057 | BNCLP | Benzo(a)anthracene | 80 | | 30 | |
| | 122358 | 5064 3 | SS500 5ASU5 | ACLP | Benzo(a)anthracene | 460 | | 30 | |
| | 2204277 | S5 099 | S50060AS | BNACLP | Benzo(a)anthracene | 440 | | 30 | |
| | 2265758 | SS50939 | SS50044 | BNACLP | Benzo(a)anthracene | 0 | | 330 | |
| | 22 3983 | 50829 | SS500 3A | ACLP | Benzo(a)anthracene | 380 | | 30 | |
| | 2266126 | SS509893 | SS50049 S | BNACLP | Benzo(a)anthracene | 360 | | 330 | |
| | 223203 | SS509 93 | SS50042AS | BNACLP | Benzo(a)Pyrene | 400 | D | 330 | Z |
| | 2203842 | SS507793 | S50028A | BNACLP | Benzo(a)Pyrene | 300 | | 330 | |
| | 22 94 | 509 | SS50042AS | BNACLP | Benzo(a)Pyrene | 300 | | 30 | |
| | 223212 | S509793 | SS50048A | ACLP | Benzo(a)Pyrene | 1200 | | 30 | |
| | 220389 | S50789 | SS50029AS | BNACLP | Benzo(a)Pyrene | 30 | | 30 | |
| | 22 5948 | S50879 | SS50038AS | BNACLP | Benzo(a)Pyrene | 840 | | 330 | |
| | 5887 | 069 | SS50057AS | BNCLP | Benzo(a)Pyrene | 790 | | 330 | |
| | 2203940 | SS50799 | SS50030A | BNACLP | Benzo(a)Pyrene | 5 | | 330 | |
| | 22 3989 | 508293 | SS50033AS | BNACLP | Benzo(a)Pyrene | | | 330 | A |
| | 22 5764 | S509393 | SS50044 S | BNACLP | Benzo(a)Pyrene | 460 | | 330 | |
| | 22364 | 5064 | S500 5ASU5 | BNACLP | Benzo(a)Pyrene | 400 | | 30 | |
| | 22646 | 509993 | SS50050A | ACLP | Benzo(a)Pyrene | 400 | | 30 | |
| | 2266 32 | 509893 | SS5004 | ACLP | Benzo(a)Pyrene | 90 | | 330 | |
| | 22 5856 | SS50999 | S50050A | BNACLP | Benzo(a)Pyrene | | | 30 | |
| | 22 94 | 509 | SS50042AS | BNACLP | Benzo(b)Fluoranthene | 600 | | 30 | |
| | 2232 35 | 509 93 | SS50042AS | NACLP | Benzo(b)Fluoranthene | 2500 | D | 30 | Z |
| | 2232125 | 509793 | SS50048A | ACLP | Benzo(b)Fluoranthene | 2000 | | 330 | |
| | 220384 | 50779 | SS50028A | BNACLP | Benzo(b)Fluoranthene | 00 | | 330 | |
| | 2203889 | 507893 | SS5002 AS | BNACLP | Benzo(b)Fluoranthene | 700 | | 330 | V |
| | 2265946 | S50879 | SS50038AS | BNACLP | Benzo(b)Fluoranthene | 350 | | 30 | |
| | 5887 | SS5 0693 | SS5005 S | BNCLP | Benzo(b)Fluoranthene | 300 | | 330 | |
| | 2266 30 | SS509893 | SS50049 | BNACLP | Benzo(b)Fluoranthene | 40 | | 30 | |
| | 2265762 | 50939 | S50044AS | BNACLP | Benzo(b)Fluoranthene | 730 | | 30 | |
| | 2203938 | S507993 | SS50030A | ACLP | Benzo(b)Fluoranthene | 64 | | 30 | |
| | 2264614 | SS509993 | SS50050AS | BNACLP | Benzo(b)Fluoranthene | 640 | | 330 | |
| | 2203987 | 508293 | SS50033AS | BNACLP | Benzo(b)Fluoranthene | 620 | JX | 30 | |
| | 122362 | SS5064 | SS50015ASU5 | BNACLP | Benzo(b)Fluoranthene | 530 | | 330 | V |
| | 2266038 | S509293 | SS50043A | BNACLP | Benzo(b)Fluoranthene | 0 | | 30 | V |
| | 2204 38 | SS50889 | SS50039 | BNACLP | Dibenzo(a,h)anthracene | 00 | | 30 | |
| | 2204 87 | SS50889 | 50039 | BNACLP | Dibenzo(a,h)anthracene | 960 | D | 330 | |
| | 2232 7 | SS509793 | SS50048AS | BNACLP | Fluoranthene | 2500 | | 330 | |
| | 58866 | 0693 | SS50057 S | BNCLP | Fluoranthene | 2 00 | | 330 | |
| | 220388 | SS507893 | SS50029AS | BNACLP | Fluoranthene | 2000 | | 330 | |
| | 2265938 | 508793 | S50038A | ACLP | Fluoranthene | 700 | | 30 | |
| | 122354 | SS506493 | SS50015ASU5 | BNACLP | Fluoranthene | 1000 | | 330 | V |
| | 2265754 | 509393 | S50044AS | BNACLP | Fluoranthene | 940 | | 330 | |
| | 2266122 | 509893 | SS5004 | BNACLP | Fluoranthene | | | 330 | |
| | 2264606 | 509993 | SS50050AS | BNACLP | Fluoranthene | 900 | | 330 | |
| | 2203979 | S508293 | SS50033A | BNACLP | Fluoranthene | 8 0 | | 30 | |
| | 2265846 | SS509993 | SS50050A | BNACLP | Fluoranthene | 60 | | 330 | |
| | 22 3930 | S507993 | SS50030A | BNACLP | Fluoranthene | 730 | | 30 | |
| | 2266030 | 50929 | SS50043AS | BNACLP | Fluoranthene | 640 | | 330 | |
| | 2247156 | SS509493 | SS50045AS | BNACLP | Fluoranthene | 580 | | 330 | V |
| | 223 84 | SS508693 | SS5003 | BNACLP | Fluoranthene | 570 | | 30 | |
| | 2247248 | SS510093 | SS5005 AS | BNACLP | Fluoranthene | 570 | | 330 | |
| | 22662 | 0493 | SS50055 | BNACLP | Fluoranthene | 520 | | 330 | |
| | 2204273 | S5 0993 | SS50060AS | BNACLP | Fluoranthene | 505 | | 330 | |
| | 5867 | SS508 | SS50032AS | BNACLP | Fluoranthene | 440 | | 30 | |
| | 587 | SS50959 | SS50046A | BNCLP | Fluoranthene | 380 | | 30 | |
| | 5832 | SS507 93 | SS50022AS | BNCLP | Fluoranthene | 370 | J | 330 | |
| | 2204469 | SS5 1 | 50064AS | BNACLP | Fluoranthene | 360 | J | 330 | |
| | 2204077 | SS508493 | SS50035AS | BNACLP | Fluoranthene | 50 | J | 30 | |
| | 2204 37 | S508893 | SS50039 | BNACLP | Indeno(1,2,3-cd)Pyrene | 00 | | 330 | JA |
| | 2204 86 | S508893 | SS50039AS | BNACLP | deno( 2,3-cd)Pyrene | 3100 | D | 330 | |
| | 220384 | 507793 | SS50028AS | BNACLP | Indeno(1,2,3-cd)Pyrene | 00 | | 330 | |
| | 2232 38 | 509 93 | SS50042AS | BNACLP | Indeno( 2,3-cd)Pyrene | 600 | DJ | 330 | Z |
| | 226594 | S50879 | SS50038AS | BNACLP | Indeno( 2,3-cd)Pyrene | | | 330 | |
| | 2232128 | S509793 | S50048A | BNACLP | Indeno( 2,3-cd)Pyrene | 42 | | 330 | |
| | 223 946 | 509 93 | SS50042AS | BNACLP | Indeno( 2,3-cd)Pyrene | | | 30 | |
| | 2263773 | SS509393 | SS50044 S | PESTCLP | PCB 1254 | 00 | | 60 | |
| | 22639 | S5 04 | SS50055AS | PESTCLP | PCB 1254 | 00 | | 60 | |
| | 2246200 | SS508993 | SS50040AS | PESTCLP | PCB 254 | 065 | | 60 | |
| | 22 5407 | SS508893 | SS50039 | PESTCLP | PCB 1254 | 900 | X | 60 | |
| | 22 5245 | SS507793 | S50028A | PESTCLP | PCB 1254 | 50 | | 60 | |
| | 226382 | S50879 | SS0038AS | PESTCLP | PCB 254 | 630 | | 60 | |
| | 2205380 | SS508493 | SS50035AS | PESTCLP | PCB 1254 | 560 | | 60 | |
| | 2263885 | SS509893 | S50049 | PESTCLP | PCB 1254 | 30 | | 160 | |
| | 2263857 | 50929 | SS50043A | PESTCLP | PCB 1254 | 220 | | 60 | |
| | 2203833 | 507793 | SS50028AS | ACLP | Pyrene | 2600 | | 30 | |
| | 2232 8 | SS509793 | SS50048AS | BNACLP | Pyrene | 2600 | | 330 | |

## Table 4 3 (Continued)

| IHSS | Sequence ID | Location | Sample N | est Grou Code | onstituent | Result in ug/kg | Qualifier | Reporting Limit | alid. |
|---|---|---|---|---|---|---|---|---|---|
| | 2203882 | SS507893 | 50029 S | BNACLP | Pyrene | 00 | | 30 | |
| | 58867 | S5 0693 | SS50057 | BNCLP | Pyrene | 600 | | 30 | |
| | 2265939 | 508793 | 50038A | ACLP | Pyrene | 500 | | 330 | |
| | 223 | SS5064 | 50015ASU | BNACLP | Pyrene | 000 | BX | 330 | A |
| | 2264607 | S509993 | SS50050AS | BNACLP | Pyrene | 730 | | 330 | |
| | 22 5 | 509393 | SS50044AS | BNACLP | Pyrene | 30 | | 330 | |
| | 22 584 | SS50999 | 50050A | BNACLP | Pyrene | | | 30 | |
| | 22 3980 | 5082 | SS50033AS | ACLP | Pyrene | 00 | J | 330 | |
| | 2266123 | 50989 | 5004 | ACLP | Pyrene | | | 330 | |
| | 220393 | SS50799 | SS50030A | B ACLP | Pyrene | 35 | | 330 | V |
| | 220427 | 099 | S50060A | BNACLP | Pyrene | 90 | | 330 | |
| | 226603 | SS50929 | S50043AS | NACLP | Pyrene | | | 330 | V |
| | 224724 | SS5 0093 | 50051A | BNACLP | Pyrene | 44 | | 30 | |
| | 223 846 | 508693 | SS50037 S | BNACLP | Pyrene | 30 | | 30 | |
| | 224 157 | S509493 | S50045A | BNACLP | Pyrene | 30 | | 30 | |
| | 2 5867 | SS508 3 | SS50032AS | BNACLP | Pyrene | 0 | J | 330 | |
| | 220447 | 51 | S50064A | ACLP | Pyrene | 340 | | 30 | |
| | 226621 | 5 04 | S50055AS | BNACLP | Pyrene | 340 | | 330 | A |
| **Exceeds ten times the Reporting Limit but less than one hundred times the Reporting Limit** | | | | | | | | | |
| 15/196 | 2204 30 | SS508893 | SS50039 | BNACLP | Benzo(a)anthracene | 4400 | | 330 | |
| | 2204 79 | S508893 | SS50039AS | BNACLP | Benzo(a)anthracene | 3500 | D | 330 | |
| | 2204 36 | 50889 | SS50039 | BNACLP | Benzo(a)Pyrene | 500 | | 330 | |
| | 2204 85 | 50889 | SS50039 | B ACLP | Benzo(a)Pyrene | 3900 | D | 30 | |
| | 2204 34 | S50889 | SS50039 | ACLP | Benzo(b)Fluoranthene | 500 | | 30 | |
| | 2204 83 | 50889 | S50039 | BNACLP | Benzo(b)Fluoranthene | 600 | | 330 | |
| | 5882 | 5 59 | S50056AS | ACLP | Dibenzo(a,h)anthracene | 9200 | D | 330 | |
| | 58780 | S5 59 | SS50056A | BNACLP | Dibenzo(a,h)anthracene | 000 | | 30 | |
| | 2204 2 | 508893 | SS50039 S | BNACLP | Fluoranthene | 000 | | 330 | |
| | 2204 | SS508893 | SS50039AS | NACLP | Fluoranthene | 9900 | D | 330 | |
| | 223202 | SS509 93 | SS50042A | BNACLP | Fluoranthene | 6200 | D | 330 | |
| | 223 3 | 509 93 | SS50042A | BNACLP | Fluoranthene | 00 | | 330 | Z |
| | 2203832 | SS507793 | SS50028AS | BNACLP | Fluoranthene | 3400 | | 330 | |
| | 58828 | SS5 059 | SS50056AS | BNACLP | Indeno( ,2,3-cd)Pyrene | 32000 | D | 330 | JA |
| | 2158779 | SS510593 | SS50056AS | BNACLP | Indeno(1,2,3-cd)Pyrene | 28000 | E | 330 | |
| | 2246396 | SS51009 | SS50051AS | PESTCLP | PCB 1254 | 3900 | | 160 | |
| | 2246368 | SS5094 | SS50045A | PESTCLP | PCB 1254 | 2400 | | 60 | |
| | 226380 | SS50999 | SS50050AS | PESTCLP | PCB 1254 | 2300 | C | 160 | |
| | 2 60260 | SS510693 | SS50057 S | PESTCLP | PCB 1254 | 2200 | X | 60 | |
| | 2204127 | SS508893 | SS50039AS | BNACLP | Pyrene | 9500 | | 30 | V |
| | 2204 7 | 50889 | SS50039 | BNACLP | Pyrene | 8400 | | 30 | |
| | 2232028 | 509193 | SS50042AS | BNACLP | Pyrene | 00 | D | 330 | |
| | 2231936 | S509193 | SS50042AS | BNACLP | Pyrene | 5 00 | | 330 | Z |
| **Exceeds one hundred times the Reporting Limit** | | | | | | | | | |
| 15/196 | 5882 | SS51059 | SS50056AS | BNACLP | Benzo(a)anthracene | 5000 | D | 330 | |
| | 58772 | SS510593 | SS50056AS | BNACLP | Benzo(a)anthracene | 0000 | E | 330 | |
| | 2158778 | SS51 593 | SS50056AS | BNACLP | Benzo(a)Pyrene | 3000 | E | 330 | |
| | 58827 | SS5 0593 | SS50056A | BNACLP | Benzo(a)Pyrene | 000 | D | 330 | |
| | 58825 | SS5 0593 | SS50056A | BNACLP | Benzo(b)Fluoranthene | 9000 | XD | 30 | |
| | 5877 | SS5 593 | SS50056AS | BNACLP | Benzo(b)Fluoranthene | 8000 | E | 30 | |
| | 588 | SS5 059 | 50056A | BNACLP | Fluoranthene | 0000 | D | 330 | |
| | 58768 | SS5 59 | SS50056AS | BNACLP | Fluoranthene | 73000 | E | 30 | |
| | 588 | S510593 | SS50056A | BNACLP | Pyrene | 0000 | D | 30 | |
| | 2158769 | S 1 593 | SS50056A | BNACLP | Pyrene | 59000 | E | 330 | |

These da are graphically disp yed on Figures 4-3a and 3b.

# Table 4-4
## Summary of Metal COCs Exceeding Background Mean in Subsurface Soil

| IHSS/Site | Sequence ID | Location | Sample N | Depth I terval | Constituent | Result in mg/kg | Qualifier | Reporting Limit | Valid. | Mean | Mean (X STD DEV) of background X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exceeds the Background Mean but is less than Background Mean plus one Standard Deviation | | | | | | | | | | | | | |
| 115/196 | 3335198 | 59593 | BH50540AS | 0' 2 | ANTIMONY | 8 5 | B | 12 | JA | 6 56 | 9 4 | 12 24 | 15 0 |
| | 3334952 | 59793 | BH50488AS | 0' 2' | ANTIMONY | 7 1 | B | 12 | JA | 6 56 | 9 4 | 12 24 | 15 0 |
| | 4981949 | 56694 | BH00122AS | 43 0-150 0 | COPPER | 25 2 | | 25 | JA | 12 59 | 25 36 | 38 13 | 50.9 |
| | 5105493 | 59894 | BH00164AS | 19 9-31 9 | COPPER | 23 3 | | 25 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2700368 | 59593 | BH50552AS | 0'-6' | COPPER | 22 85 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 5009789 | 58794 | BH00054AS | 0 0-2 4 | COPPER | 22 6 | | 5 | JA | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2633713 | 58593 | BH50404AS | 12.5' 18 1 | COPPER | 22 5 | | 5 | V | 12 59 | 25.36 | 38 13 | 50.9 |
| | 4929377 | 57594 | BH00082AS | 6 0-12 0 | COPPER | 22 4 | | 25 | V | 12.59 | 25.36 | 38 13 | 50.9 |
| | 5105437 | 59494 | BH00160AS | 11 9-17 9 | COPPER | 22 4 | | 25 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 4929349 | 57594 | BH00078AS | 0 0-6 0 | COPPER | 22 2 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2686964 | 59293 | BH50441AS | 12' 18 9' | COPPER | 21 7 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2700126 | 59793 | BH50486AS | 13.3 15.3 | COPPER | 21 6 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2700434 | 59593 | BH50554AS | 14.4' 16 4 | COPPER | 21 3 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 4932915 | 57594 | BH00085AS | 18 0-23 0 | COPPER | 21 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2700500 | 59493 | BH50522AS | 12 9' 17.8 | COPPER | 20 7 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2091481 | 50792 | BH50105AS | 0' 10' | COPPER | 20 5 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 4981921 | 56694 | BH00113AS | 43 0-150 0 | COPPER | 20 4 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 4880286 | 58494 | BH00068AS | 0 0-6 0 | COPPER | 20 3 | | 25 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 5105297 | 57094 | BH00147AS | 0 0-40 0 | COPPER | 19 9 | | 25 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 4961693 | 56694 | BH00112AS | 0 0-41 0 | COPPER | 19 6 | | 25 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 4880314 | 58494 | BH00071AS | 6 0-9 5 | COPPER | 19 5 | | 25 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2133994 | 51092 | BH50153AS | 0'-6' | COPPER | 19 1 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 4961553 | 56694 | BH00096AS | 0 0-6 0 | COPPER | 18 4 | | 25 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 5105325 | 57094 | BH00148AS | 0 0-40 0 | COPPER | 17 9 | | 25 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 5009761 | 58694 | BH00052AS | 0 0-2 9 | COPPER | 17 3 | | 5 | JA | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2700802 | 63193 | BH50616AS | 0'-6' | COPPER | 17 3 | | 5 | JA | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2700044 | 59793 | BH50484AS | 0' 7.3 | COPPER | 17 2 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2120433 | 50892 | BH50121AS | 0'-6' | COPPER | 17 1 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2686942 | 59293 | BH50440AS | 6' 12' | COPPER | 16 9 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2700692 | 61293 | BH50505AS | 6' 10.6' | COPPER | 16 9 | | 5 | JA | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2120477 | 50892 | BH50123AS | 8' 16' | COPPER | 16 7 | | 5 | V | 12.59 | 25.36 | 38 13 | 50.9 |
| | 4961525 | 56694 | BH00095AS | 0 0-6 0 | COPPER | 16 7 | | 25 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2686882 | 59293 | BH50439AS | 0'-6' | COPPER | 16 7 | | 5 | V | 12 59 | 25.36 | 38 13 | 50.9 |
| | 2700890 | 61093 | BH50603AS | 6' 13 | COPPER | 16 7 | | 5 | JA | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2120389 | 50592 | BH50064AS | 12' 18' | COPPER | 16 6 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2700192 | 59193 | BH50457AS | 2'-8' | COPPER | 16.55 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 3334959 | 59793 | BH50488AS | 0' 2' | COPPER | 16 5 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2060864 | 50692 | BH50089AS | 0' 14 | COPPER | 15 9 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2005309 | 50392 | BH50015AS | 18' 24 | COPPER | 15 8 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2746550 | 58693 | BH50349AS | 12' 19.5' | COPPER | 15 55 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2120455 | 50892 | BH50122AS | 6' 12' | COPPER | 15 3 | | 5 | V | 12.59 | 25.36 | 38 13 | 50.9 |
| | 2700824 | 63193 | BH50617AS | 6' 12' | COPPER | 15 3 | | 5 | JA | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2005272 | 50392 | BH50016AS | 25' 30' | COPPER | 14 8 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2060820 | 50692 | BH50087AS | 0'-6' | COPPER | 14 8 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2650787 | 58693 | BH50405AS | 25.5' 29.5' | COPPER | 14.7 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 3334995 | 59293 | BH50444AS | 0' 2' | COPPER | 14.7 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 4961581 | 56694 | BH00098AS | 6 0-10 0 | COPPER | 14.5 | | 25 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 5105353 | 59494 | BH00152AS | 0 0-5 9 | COPPER | 14.5 | | 25 | V | 12.59 | 25.36 | 38 13 | 50.9 |
| | 2037352 | 50492 | BH50039AS | 12' 18' | COPPER | 13 9 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2060842 | 50692 | BH50088AS | 6' 12' | COPPER | 13 2 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2700632 | 61293 | BH50504AS | 0'-6' | COPPER | 12 8 | | 5 | JA | 12 59 | 25 36 | 38 13 | 50.9 |
| | 5105465 | 59894 | BH00162AS | 17 9-19 9 | COPPER | 12.7 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 4880295 | 58494 | BH00068AS | 0 0-6 0 | NICKEL | 33 2 | | 40 | JA | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2633635 | 58593 | BH50347AS | 0'-6' | NICKEL | 33 05 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2700872 | 60993 | BH50588AS | 0'-6' | NICKEL | 28 6 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 4961674 | 56694 | BH00111AS | 0 0-35 0 | NICKEL | 27 1 | | 40 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2700438 | 59593 | BH50554AS | 14 4 16.4 | NICKEL | 25.5 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 5105502 | 59894 | BH00164AS | 19 9-31 9 | NICKEL | 23 7 | | 40 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2120393 | 50592 | BH50064AS | 12' 18' | NICKEL | 23 6 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 3335189 | 59593 | BH50540AS | 0' 2' | NICKEL | 23.5 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2133976 | 50992 | BH50140AS | 0' 16' | NICKEL | 23 4 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 4981958 | 56694 | BH00122AS | 43 0-150 0 | NICKEL | 23 4 | | 40 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 5105306 | 57094 | BH00147AS | 0 0-40 0 | NICKEL | 22 6 | | 40 | V | 19 81 | 40 37 | 60 93 | 81.49 |

# Table 4 4 (Continued)

| IHSS/Site | Sequence ID | Locatio | Sample N | Depth Interval | Constituen | Result in mg/kg | Qualifier | Reporting Limit | V lid. | Mean | X 1 | X 2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Mean (X STD DEV) of background | | | |
| | 5105334 | 57094 | BH00148AS | 0.0-40.0 | NICKEL | 22 | | 40 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 5105446 | 59494 | BH00160AS | 11.9-17.9 | NICKEL | 21.3 | | 40 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2746340 | 58393 | BH50343AS | 0'-6' | NICKEL | 21 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2133932 | 50992 | BH50138AS | 0'-6' | NICKEL | 20.9 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2700048 | 59793 | BH50484AS | 0' 7.3 | NICKEL | 20.4 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2700372 | 59593 | BH50552AS | 0'-6' | NICKEL | 20.15 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2746534 | 58493 | BH50346AS | 6' 12 | SILVER | 13.7 | | 2 | V | 5.7 | 15.1 | 24.5 | 33.9 |
| | 2133934 | 50992 | BH50138AS | 0'-6' | SILVER | 11.3 | | 2 | V | 5.7 | 15.1 | 24.5 | 33.9 |
| | 2746512 | 58493 | BH50345AS | 0'-6' | SILVER | 11.2 | | 2 | V | 5.7 | 15.1 | 24.5 | 33.9 |
| | 3335055 | 59493 | BH50524AS | 4 2 | SILVER | 8.2 | | 2 | V | 5.7 | 15.1 | 24.5 | 33.9 |
| | 2133978 | 50992 | BH50140AS | 0' 16' | SILVER | 6.5 | | 2 | V | 5.7 | 15.1 | 24.5 | 33.9 |
| 133.1 | 2700280 | 58893 | BH50458AS | 0'-6' | COPPER | 23.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2453018 | 56493 | BH50219AS | 0'-6' | COPPER | 21 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2700302 | 58893 | BH50459AS | 6' 12 | COPPER | 20.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452294 | 56293 | BH50206AS | 0'-6' | COPPER | 15.9 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 3334885 | 58893 | BH50646AS | 0' 2' | COPPER | 14.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2700284 | 58893 | BH50458AS | 0'-6' | NICKEL | 23.1 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2743652 | 56393 | BH50211AS | 0' 2' | SILVER | 9.8 | | 2 | V | 5.7 | 15.1 | 24.5 | 33.9 |
| 133.2 | 2687052 | 58793 | BH50409AS | 18' 24 | COPPER | 24.7 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2453410 | 57593 | BH50301AS | 12' 14 | COPPER | 19.4 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452630 | 57393 | BH50256AS | 0' 2 | COPPER | 19.3 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452686 | 57393 | BH50258AS | 4.6' 12.1 | COPPER | 19.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452658 | 57393 | BH50257AS | 0' 6.6' | COPPER | 18.9 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2515255 | 57293 | BH50252AS | 0'-6' | COPPER | 17.6 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2425182 | 56993 | BH50202AS | 8.1 14 | COPPER | 17.5 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2425322 | 57093 | BH50241AS | 0' 2 | COPPER | 17.5 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452714 | 57393 | BH50259AS | 10.2' 18.1 | COPPER | 17.4 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452546 | 57193 | BH50246AS | 0' 2' | COPPER | 17.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2686986 | 58793 | BH50406AS | 0' 6.1 | COPPER | 16.9 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2425350 | 57093 | BH50242AS | 0'-6' | COPPER | 16.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452574 | 57193 | BH50247AS | 0' 5.5' | COPPER | 15 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2462699 | 56993 | BH50199AS | 0'-4' | COPPER | 14.5 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2453158 | 57493 | BH50261AS | 0' 2' | COPPER | 14.5 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2425266 | 56893 | BH50239AS | 8.3 14.3 | COPPER | 14.3 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2453270 | 57493 | BH50265AS | 18' 20' | COPPER | 14.3 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2425406 | 57093 | BH50244AS | 12.3 18.6' | COPPER | 14 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2687008 | 58793 | BH50407AS | 6.1 12 | COPPER | 13.95 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2515284 | 57293 | BH50253AS | 6' 12' | COPPER | 13.7 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2515422 | 57293 | BH50292AS | 26' 30' | COPPER | 13.6 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2462677 | 56993 | BH50198AS | 0' 2 | COPPER | 13.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2515226 | 57293 | BH50251AS | 0' 2' | COPPER | 12.9 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2515313 | 57293 | BH50254AS | 12' 18' | COPPER | 12.7 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452664 | 57393 | BH50257AS | 0'-6.6' | NICKEL | 30.6 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2425356 | 57093 | BH50242AS | 0'-6' | NICKEL | 27.7 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2687056 | 58793 | BH50409AS | 18' 24 | NICKEL | 25.7 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2515259 | 57293 | BH50252AS | 0'-6' | NICKEL | 25.4 | | 8 | JA | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2687078 | 58793 | BH50410AS | 24 28.4 | NICKEL | 24.8 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2425412 | 57093 | BH50244AS | 12.3 18.6' | NICKEL | 22.5 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| | 2452636 | 57393 | BH50256AS | 0' 2' | NICKEL | 20.8 | | 8 | V | 19.81 | 40.37 | 60.93 | 81.49 |
| 133.3 | 3335136 | 61193 | BH50649AS | 0' 2' | ANTIMONY | 6.7 | B | 12 | JA | 6.56 | 9.4 | 12.24 | 15.08 |
| | 2700588 | 61493 | BH50585AS | 8.5' 15.9' | COPPER | 25.3 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2700736 | 61393 | BH50570AS | 0'-6' | COPPER | 24.55 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452462 | 56593 | BH50224AS | 13' 17' | COPPER | 23.9 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2701000 | 63093 | BH50559AS | 15' 20' | COPPER | 20.55 | | 5 | JA | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2700758 | 61393 | BH50576AS | 0' 10' | COPPER | 20.1 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452518 | 56693 | BH50227AS | 0'-6' | COPPER | 20 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2700566 | 61493 | BH50583AS | 0' 8.5' | COPPER | 19.8 | | 5 | JA | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2700978 | 59693 | BH50558AS | 12 15.5' | COPPER | 18.15 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2453074 | 56793 | BH50232AS | 0'-6' | COPPER | 18 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452434 | 56593 | BH50223AS | 6' 12' | COPPER | 17 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2700912 | 59693 | BH50556AS | 0'-6' | COPPER | 16.5 | | 5 | JA | 12.59 | 25.36 | 38.13 | 50.9 |
| | 3335123 | 61193 | BH50649AS | 0' 2 | COPPER | 15 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2452490 | 56693 | BH50226AS | 0' 2' | COPPER | 14.5 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |
| | 2453130 | 56793 | BH50234AS | 10' 12' | COPPER | 14.5 | | 5 | V | 12.59 | 25.36 | 38.13 | 50.9 |

# Table 4 4 (Continued)

| IHSS/Site | Sequence ID | Locatio | Sample N | Depth I terval | C nstituen | Result in mg/kg | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2452378 | 56593 | BH50221AS | 0' 2' | COPPER | 13 6 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2453102 | 56793 | BH50233AS | 6' 12 | COPPER | 13 4 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2700610 | 61493 | BH50584AS | 5.5' 13.5' | COPPER | 13 4 | | 5 | JA | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2453046 | 56793 | BH50231AS | 0' 2 | COPPER | 13 3 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 3334793 | 61493 | BH50651AS | 0' 2' | COPPER | 13 3 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2452406 | 56593 | BH50222AS | 0'-6' | COPPER | 13 1 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2700350 | 61193 | BH50503AS | 6' 10' | NICKEL | 34 65 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2700916 | 59693 | BH50556AS | 0'-6' | NICKEL | 21 3 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2700762 | 61393 | BH50576AS | 0' 10' | NICKEL | 20 9 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| 133 4 | 2519064 | 55793 | BH50307AS | 0'-6' | CADMIUM | 0 76 | B | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2519068 | 55793 | BH50307AS | 0'-6' | COPPER | 24 9 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2519090 | 55793 | BH50308AS | 6' 12' | COPPER | 23 9 | | 5 | V | 12.59 | 25.36 | 38 13 | 50.9 |
| | 3335051 | 58993 | BH50647AS | 0' 2' | COPPER | 23 4 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2358212 | 55593 | BH50082AS | 18' 24 | COPPER | 23 1 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2463001 | 55993 | BH50187AS | 9.3 15' | COPPER | 22 7 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2519134 | 55793 | BH50309AS | 12.4 18.4 | COPPER | 21 7 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2358240 | 55593 | BH50083AS | 24' 26' | COPPER | 21 1 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2358128 | 55593 | BH50058AS | 6' 12' | COPPER | 20 4 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2700214 | 59093 | BH50411AS | 0'-6' | COPPER | 19 65 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2743712 | 58093 | BH50313AS | 0' 2 | COPPER | 19 5 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2358100 | 55593 | BH50057AS | 0'-6' | COPPER | 19 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2703235 | 58993 | BH50480AS | 0'-6.4 | COPPER | 17 75 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2703317 | 58993 | BH50482AS | 6.4 12 | COPPER | 16 3 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2462891 | 56093 | BH50271AS | 2'-8' | COPPER | 15 5 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2425126 | 55893 | BH50141AS | 0' 2' | COPPER | 15 2 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2700236 | 59093 | BH50412AS | 6' 12' | COPPER | 14.3 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 3335105 | 59093 | BH50648AS | 0' 2' | COPPER | 13 2 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2743744 | 58093 | BH50314AS | 0'-8' | MOLYBDENUM | 19 6 | B | 40 | V | 15 39 | 24.4 | 33 41 | 42.42 |
| | 2358218 | 55593 | BH50082AS | 18' 24 | NICKEL | 30 3 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2519072 | 55793 | BH50307AS | 0'-6' | NICKEL | 26 1 | | 8 | V | 19 81 | 40.37 | 60 93 | 81 49 |
| | 2519094 | 55793 | BH50308AS | 6' 12' | NICKEL | 25 3 | | 8 | V | 19 81 | 40.37 | 60 93 | 81.49 |
| | 2358134 | 55593 | BH50058AS | 6' 12' | NICKEL | 20 3 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2743716 | 58093 | BH50313AS | 0' 2 | NICKEL | 20 1 | | 8 | JA | 19 81 | 40 37 | 60 93 | 81.49 |
| | 3335037 | 58993 | BH50647AS | 0' 2' | SILVER | 11 6 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| 133.5 | 2358012 | 55493 | BH50033AS | 6' 12 4' | CADMIUM | 0 7 | B | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2358352 | 55293 | BH50107AS | 6' 10' | COPPER | 19 9 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2358016 | 55493 | BH50033AS | 6' 12 4 | COPPER | 19 9 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2358324 | 55293 | BH50106AS | 0'-6' | COPPER | 18 2 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2357988 | 55493 | BH50032AS | 0'-6' | COPPER | 17 6 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2331328 | 55493 | BH50166AS | 17.3 24.3 | COPPER | 13 9 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2331300 | 55393 | BH50117AS | 25.8' 33.3 | COPPER | 13 7 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2358268 | 55193 | BH50090AS | 0'-6' | COPPER | 13 6 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2432354 | 55393 | BH50165AS | 12 17.2' | COPPER | 13 35 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2358330 | 55293 | BH50106AS | 0'-6' | NICKEL | 22 2 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| 133 6 | 2357932 | 54893 | BH50017AS | 0'-6.5' | COPPER | 24 1 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2358380 | 55093 | BH50131AS | 6' 13.2' | COPPER | 19 5 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2358044 | 54993 | BH50035AS | 0'-6' | COPPER | 19 4 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2358072 | 54993 | BH50042AS | 6' 10' | COPPER | 15 1 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2358050 | 54993 | BH50035AS | 0'-6' | NICKEL | 19 9 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| 142.10 | 1882999 | 50092 | BH50000AS | 0' 14.8' | CADMIUM | 0 82 | B | 1 | V | 0 64 | 0 88 | 1 12 | 1 36 |
| | 1883003 | 50092 | BH50000AS | 0' 14.8' | COPPER | 20.5 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2075487 | 51193 | BH50168AS | 0' 10' | COPPER | 16 8 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| 142.11 | 1883227 | 50292 | BH50008AS | 0' 14.5' | COPPER | 22 8 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| Magnetic Anomaly W f 133 | 2860046 | 64493 | BH50632AS | 12' 14' | ANTIMONY | 7 7 | B | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| | 2859958 | 64593 | BH50636AS | 12' 18' | ANTIMONY | 6 9 | B | 12 | JA | 6.56 | 9 4 | 12.24 | 15 08 |
| | 2860031 | 64493 | BH50631AS | 6' 12' | COPPER | 18 6 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2859817 | 64693 | BH50638AS | 0'-6' | COPPER | 18 4 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2860009 | 64493 | BH50630AS | 0'-6' | COPPER | 17 9 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2859921 | 64593 | BH50634AS | 0'-6' | COPPER | 17 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2860053 | 64493 | BH50632AS | 12' 14 | COPPER | 16 5 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2859943 | 64593 | BH50635AS | 6' 12' | COPPER | 16 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2859877 | 64693 | BH50639AS | 6 12' | COPPER | 15 6 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 2859899 | 64693 | BH50640AS | 12' 16' | COPPER | 14.5 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2859969 | 64593 | BH50636AS | 12' 18' | NICKEL | 27 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |

# Table 4 4 (Continued)

| IHSS/Site | Sequence ID | Location | Sample N | Depth I terval | Constituen | Result in mg/kg | Qualifier | Reporting Limi | V lid. | Mean (X STD DEV) of background Mea | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2859821 | 64693 | BH50638AS | 0'-6' | NICKEL | 24 | | 8 | V | 19 81 | 40 37 | 60.93 | 81.49 |
| | 2860035 | 64493 | BH50631AS | 6' 12 | NICKEL | 23 9 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2860013 | 64493 | BH50630AS | 0'-6' | NICKEL | 23 3 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2859881 | 64693 | BH50639AS | 6' 12 | NICKEL | 23 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2859947 | 64593 | BH50635AS | 6' 12 | NICKEL | 22.5 | | 8 | V | 19 81 | 40.37 | 60 93 | 81.49 |
| | 2859925 | 64593 | BH50634AS | 0'-6' | NICKEL | 22 1 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| S133 | 2569395 | 57993 | BH50316AS | 4 9' 8 1 | COPPER | 19 55 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2519398 | 57793 | BH50338AS | 24 28 9' | COPPER | 16.8 | | 5 | V | 12 59 | 25.36 | 38 13 | 50.9 |
| | 3348803 | 57893 | BH50342AS | 18 7' 26.4 | COPPER | 14 7 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| TDEM 1 | 4933027 | 60094 | BH00089AS | 0 0-5 0 | COPPER | 19 6 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 5209091 | 55194 | BH00029AS | 6 0-12.0 | COPPER | 16 4 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 5209203 | 55294 | BH00033AS | 12 0-15 2 | COPPER | 15 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 5209175 | 55294 | BH00032AS | 6 0-12 0 | COPPER | 13.5 | | 25 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 5209147 | 55294 | BH00031AS | 0 0-6 0 | COPPER | 13 4 | | 25 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 5209156 | 55294 | BH00031AS | 0 0-6 0 | NICKEL | 29 3 | | 40 | JA | 19 81 | 40 37 | 60 93 | 81.49 |
| | 4933008 | 59994 | BH00088AS | 0 0-5 3 | NICKEL | 26.5 | | 40 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| TDEM 2 | 4880230 | 55894 | BH00036AS | 0 0-6 0 | COPPER | 23 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 5284212 | 56094 | BH00038AS | 6 0-12 0 | NICKEL | 32 6 | | 40 | Y | 19 81 | 40 37 | 60.93 | 81 49 |
| | 5284268 | 56094 | BH00040AS | 18 0-22 0 | NICKEL | 30 6 | | 40 | Y | 19 81 | 40 37 | 60 93 | 81 49 |
| | 5284240 | 56094 | BH00039AS | 12 0-18 0 | NICKEL | 24.6 | | 40 | Y | 19 81 | 40 37 | 60 93 | 81 49 |
| | 5284249 | 56094 | BH00040AS | 18 0-22 0 | SILVER | 8 5 | | 10 | Y | 5 7 | 15 1 | 24.5 | 33 9 |
| TDEM W133 | 4880258 | 58894 | BH00064AS | 0 0-2.7 | COPPER | 19 6 | | 25 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| W209 | 2519178 | 57693 | BH50319AS | 0'-6' | COPPER | 18 9 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 3334903 | 57693 | BH50642AS | 0' 2' | COPPER | 16 9 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| **Exceeds the Background Mean plus one Standard Deviation but is less than Background Mean plus two Standard Deviations** | | | | | | | | | | | | | |
| 115/196 | 2746568 | 58693 | BH50350AS | 19.5' 25.5' | CADMIUM | 1 1 | B | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 3335069 | 59493 | BH50524AS | 4 2' | COPPER | 37 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 3335013 | 58693 | BH50644AS | 0' 2' | COPPER | 34.5 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 3335185 | 59593 | BH50540AS | 0' 2 | COPPER | 30 9 | | 5 | V | 12 59 | 25.36 | 38 13 | 50.9 |
| | 2650809 | 58693 | BH50348AS | 0'-6' | COPPER | 29 8 | | 5 | V | 12.59 | 25.36 | 38 13 | 50.9 |
| | 4961665 | 56694 | BH00111AS | 0 0-35 0 | COPPER | 29 7 | | 25 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2037296 | 50492 | BH50037AS | 0'-6' | COPPER | 26 6 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2700868 | 60993 | BH50588AS | 0'-6' | COPPER | 26 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2700828 | 63193 | BH50617AS | 6' 12' | NICKEL | 46 6 | | 8 | V | 19 81 | 40.37 | 60 93 | 81 49 |
| 133 1 | 2743678 | 56393 | BH50212AS | 2'-6' | MOLYBDENUM | 24.5 | B | 40 | V | 15 39 | 24.4 | 33 41 | 42.42 |
| | 4961506 | 57294 | BH00091AS | 0 0-4 0 | NICKEL | 58 | | 40 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2743628 | 56393 | BH50213AS | 6'-8' | NICKEL | 45 3 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| 133 2 | 2452770 | 57393 | BH50291AS | 22 1 26 1 | COPPER | 34.2 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2687074 | 58793 | BH50410AS | 24 28.4 | COPPER | 27 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2462725 | 56993 | BH50201AS | | NICKEL | 51 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| 133.3 | 2700346 | 61193 | BH50503AS | 6' 10' | COPPER | 29.8 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2700956 | 59693 | BH50557AS | 6' 12' | COPPER | 28 2 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 3334867 | 61393 | BH50650AS | 0' 2' | COPPER | 27 3 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2452471 | 56593 | BH50224AS | 13' 17' | SILVER | 15 6 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| 133 4 | 2743729 | 58093 | BH50314AS | 0'-8' | BERYLLIUM | 12 2 | | 1 | V | 4 66 | 9 43 | 14.2 | 18 97 |
| | 2462935 | 55993 | BH50162AS | 0' 2 | COPPER | 27 9 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2519046 | 55793 | BH50306AS | 0' 2' | COPPER | 26 4 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2700258 | 59093 | BH50413AS | 12' 16.3 | COPPER | 26 3 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 5422816 | 55694 | BH00041AS | 0 0-6 0 | NICKEL | 59 6 | | 2.58 | Y | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2462961 | 55993 | BH50151AS | 0'-6' | NICKEL | 54.8 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2463007 | 55993 | BH50187AS | 9.3 15' | SILVER | 16 4 | | 2 | JA | 5 7 | 15 1 | 24.5 | 33 9 |
| Magne ic Anomaly W f 133 | 2860002 | 64493 | BH50630AS | 0'-6' | ANTIMONY | 11 1 | B | 12 | JA | 6 56 | 9 4 | 12.24 | 15.08 |
| | 2859914 | 64593 | BH50634AS | 0'-6' | ANTIMONY | 9 5 | B | 12 | JA | 6 56 | 9 4 | 12.24 | 15 08 |
| | 2859810 | 64693 | BH50638AS | 0'-6' | ANTIMONY | 9 5 | B | 12 | JA | 6 56 | 9 4 | 12.24 | 15 08 |
| | 2859991 | 64593 | BH50637AS | 18' 20' | NICKEL | 58 8 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2859903 | 64693 | BH50640AS | 12' 16' | NICKEL | 51 8 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| S133 | 2569391 | 57993 | BH50316AS | 4 9' 8 1 | CADMIUM | 0 935 | | 1 | V | 0 64 | 0 88 | 1 12 | 1 36 |
| | 2569399 | 57993 | BH50316AS | 4 9'-8 1 | NICKEL | 45 4 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| TDEM-1 | 4932999 | 59994 | BH00088AS | 0 0-5 3 | COPPER | 37 9 | | 25 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| TDEM-2 | 5284182 | 56094 | BH00037AS | 0 0-6 0 | MOLYBDENUM | 25 | | 200 | Y | 15 39 | 24.4 | 33 41 | 42.42 |
| | 5372479 | 55994 | BH00035AS | 6 0-11 2 | NICKEL | 44 9 | EN | 2 94 | Y | 19 81 | 40 37 | 60 93 | 81 49 |
| | 5284193 | 56094 | BH00038AS | 6 0-12 0 | SILVER | 23 1 | | 10 | Y | 5 7 | 15 1 | 24.5 | 33 9 |

# Table 4 4 (Continued)

| IHSS/Site | Sequence ID | Location | Sample N | Depth Interval | Constituent | Result m mg/kg | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exceeds the Background Mea plus two Standard Deviations bu is less than Background Mea plus three Standard Deviations | | | | | | | | | | | | | |
| 115/196 | 2746354 | 58393 | BH50344AS | 6' 12 7' | CADMIUM | 1 3 | | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2650805 | 58693 | BH50348AS | 0'-6' | CADMIUM | 1 2 | | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2633685 | 58593 | BH50403AS | 6' 12.5' | COPPER | 50 8 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2633629 | 58593 | BH50347AS | 0'-6' | COPPER | 49 85 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 5009655 | 57994 | BH00047AS | 0 0-6 3 | COPPER | 42 4 | | 5 | JA | 12.59 | 25.36 | 38 13 | 50.9 |
| | 2700894 | 61093 | BH50603AS | 6' 13 | NICKEL | 73 8 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 5009660 | 57994 | BH00047AS | 0 0-6 3 | NICKEL | 69 9 | | 8 | JA | 19 81 | 40.37 | 60 93 | 81.49 |
| 133 1 | 2743672 | 56393 | BH50212AS | 2'-6' | NICKEL | 66 3 | | 8 | V | 19 81 | 40.37 | 60 93 | 81.49 |
| | 4961487 | 57294 | BH00091AS | 0 0-4.0 | SILVER | 26 9 | | 10 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| 133 2 | 2687023 | 58793 | BH50408AS | 12' 18' | ANTIMONY | 14 2 | | 12 | JA | 6.56 | 9 4 | 12.24 | 15 08 |
| | 2462670 | 56993 | BH50198AS | 0' 2' | ANTIMONY | 14.1 | B | 12 | JA | 6.56 | 9 4 | 12 24 | 15.08 |
| | 2515251 | 57293 | BH50252AS | 0'-6' | CADMIUM | 1 3 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2462695 | 56993 | BH50199AS | 0'-4 | CADMIUM | 1 2 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| 133 4 | 2462884 | 56093 | BH50271AS | 2'-8' | ANTIMONY | 15 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15.08 |
| | 2519042 | 55793 | BH50306AS | 0' 2' | CADMIUM | 1 3 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2743690 | 58093 | BH50315AS | 10' 12 | COPPER | 40 2 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| C ncrete Pad | 5009822 | 56194 | BH00043AS | 0 0-6 0 | NICKEL | 75 9 | | 8 | JA | 19 81 | 40 37 | 60 93 | 81.49 |
| Mag. An m. | 2860057 | 64493 | BH50632AS | 12' 14 | NICKEL | 72 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| S133 | 2519391 | 57793 | BH50338AS | 24 28 9' | ANTIMONY | 13 5 | B | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| Exceeds the Background Mean plus three Standard Deviations | | | | | | | | | | | | | |
| 115/196 | 2700707 | 59493 | BH50520AS | 0'-6.3 | ANTIMONY | 19.5 | | 12 | V | 6 56 | 9 4 | 12.24 | 15 08 |
| | 2746351 | 58393 | BH50344AS | 6' 12.7' | ANTIMONY | 15 8 | | 12 | JA | 6 56 | 9 4 | 12.24 | 15 08 |
| | 2746521 | 58493 | BH50346AS | 6' 12' | ANTIMONY | 15 6 | | 12 | JA | 6.56 | 9 4 | 12 24 | 15.08 |
| | 2746524 | 58493 | BH50346AS | 6' 12' | CADMIUM | 2 3 | | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2633625 | 58593 | BH50347AS | 0'-6' | CADMIUM | 2 2 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2700714 | 59493 | BH50520AS | 0' 6.3 | COPPER | 6920 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2746528 | 58493 | BH50346AS | 6' 12 | COPPER | 749 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2746358 | 58393 | BH50344AS | 6' 12 7' | COPPER | 361 | | 5 | V | 12.59 | 25 36 | 38.13 | 50.9 |
| | 2700456 | 59493 | BH50521AS | 6 9' 12 9' | COPPER | 117 35 | | 5 | V | 12 59 | 25.36 | 38 13 | 50.9 |
| | 2650831 | 58693 | BH50417AS | 6' 12' | COPPER | 92 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2746336 | 58393 | BH50343AS | 0'-6' | COPPER | 73 5 | | 5 | V | 12.59 | 25.36 | 38 13 | 50 9 |
| | 2133927 | 50992 | BH50138AS | 0'-6' | COPPER | 65 7 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2746506 | 58493 | BH50345AS | 0'-6' | COPPER | 59 1 | | 5 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2133972 | 50992 | BH50140AS | 0' 16' | COPPER | 58 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2746538 | 58493 | BH50346AS | 6' 12 | MOLYBDENUM | 190 | | 40 | V | 15 39 | 24.4 | 33 41 | 42.42 |
| | 2746362 | 58393 | BH50344AS | 6' 12 7' | NICKEL | 118 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 4880323 | 58494 | BH00071AS | 6 0-9.5 | NICKEL | 102 | | 40 | JA | 19 81 | 40.37 | 60 93 | 81 49 |
| | 2700718 | 59493 | BH50520AS | 0'-6.3 | NICKEL | 91 7 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2746532 | 58493 | BH50346AS | 6' 12 | NICKEL | 91 2 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2700850 | 63193 | BH50618AS | 12' 20' | NICKEL | 84.9 | | 8 | V | 19 81 | 40 37 | 60 93 | 81.49 |
| | 2700720 | 59493 | BH50520AS | 0' 6.3' | SILVER | 36 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| 133 1 | 2743661 | 56393 | BH50212AS | 2'-6' | ANTIMONY | 33 2 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| | 2743617 | 56393 | BH50213AS | 6'-8 | ANTIMONY | 19 8 | | 12 | JA | 6.56 | 9 4 | 12.24 | 15 08 |
| | 4961491 | 57294 | BH00091AS | 0 0-4.0 | BERYLLIUM | 22 8 | | 5 | V | 4.66 | 9 43 | 14.2 | 18 97 |
| | 2743664 | 56393 | BH50212AS | 2'-6' | CADMIUM | 56 9 | | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 4961493 | 57294 | BH00091AS | 0 0-4.0 | CADMIUM | 15 2 | | 5 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2743620 | 56393 | BH50213AS | 6'-8' | CADMIUM | 3 2 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2743642 | 56393 | BH50211AS | 0' 2' | CADMIUM | 2 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2743668 | 56393 | BH50212AS | 2'-6' | COPPER | 2920 | | 5 | V | 12.59 | 25 36 | 38 13 | 50 9 |
| | 4961497 | 57294 | BH00091AS | 0 0-4.0 | COPPER | 365 | | 25 | V | 12.59 | 25 36 | 38 13 | 50.9 |
| | 2743646 | 56393 | BH50211AS | 0' 2' | COPPER | 158 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2743624 | 56393 | BH50213AS | 6'-8' | COPPER | 83 6 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 4961504 | 57294 | BH00091AS | 0 0-4.0 | MOLYBDENUM | 470 | | 200 | V | 15 39 | 24.4 | 33 41 | 42.42 |
| | 2743674 | 56393 | BH50212AS | 2'-6' | SILVER | 158 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| 133 2 | 2463060 | 56893 | BH50238AS | 4 8.3 | ANTIMONY | 149 | | 12 | JA | 6 56 | 9 4 | 12.24 | 15 08 |
| | 2686979 | 58793 | BH50406AS | 0'-6 1 | ANTIMONY | 24 2 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15.08 |
| | 2687045 | 58793 | BH50409AS | 18' 24 | ANTIMONY | 21 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| | 2463062 | 56893 | BH50238AS | 4 8.3 | BERYLLIUM | 131 | | 1 | V | 4 66 | 9 43 | 14.2 | 18 97 |
| | 2462717 | 56993 | BH50201AS | | CADMIUM | 24.9 | | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 2463063 | 56893 | BH50238AS | 4 8.3 | CADMIUM | 17 6 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1 36 |
| | 2463041 | 56893 | BH50237AS | 2'-4 | CADMIUM | 2 6 | | 1 | JA | 0 64 | 0 88 | 1 36 |
| | 2425178 | 56993 | BH50202AS | 8 1 14 | CADMIUM | 1 6 | | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |

# Table 4 4 (Continued)

| IHSS/Site | Sequence ID | Locatio | Sample N | Depth Interval | Constitue | Result in mg/kg | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) f background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2463067 | 56893 | BH50238AS | 4 8.3 | COPPER | 1380 | | 5 | V | 12 59 | 25 36 | 38 13 | 50.9 |
| | 2462721 | 56993 | BH50201AS | | COPPER | 149 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2463045 | 56893 | BH50237AS | 2'-4 | COPPER | 64.1 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2463077 | 56893 | BH50238AS | 4 8 3 | MOLYBDENUM | 129 | | 40 | V | 15 39 | 24 4 | 33 41 | 42.42 |
| | 2463071 | 56893 | BH50238AS | 4 8.3 | NICKEL | 4750 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2463073 | 56893 | BH50238AS | 4 8.3 | SILVER | 190 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| | 2462727 | 56993 | BH50201AS | | SILVER | 41 2 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| 133.3 | 2700342 | 61193 | BH50503AS | 6' 10' | CADMIUM | 1 4 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| 133 4 | 2703228 | 58993 | BH50480AS | 0' 6.4 | ANTIMONY | 51 5 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| | 2743727 | 58093 | BH50314AS | 0'-8' | ANTIMONY | 50 5 | | 12 | JA | 6.56 | 9 4 | 12 24 | 15.08 |
| | 3374234 | 59093 | BH50667AS | 0'-6' | ANTIMONY | 33 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15.08 |
| | 2462972 | 55993 | BH50161AS | 4' 9.3 | ANTIMONY | 28 | | 12 | JA | 6 56 | 9 4 | 12.24 | 15 08 |
| | 2462950 | 55993 | BH50151AS | 0'-6' | ANTIMONY | 19 6 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| | 2703310 | 58993 | BH50482AS | 6 4 12' | ANTIMONY | 19 45 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| | 2519083 | 55793 | BH50308AS | 6' 12' | ANTIMONY | 16 4 | | 12 | JA | 6 56 | 9 4 | 12 24 | 15 08 |
| | 2462953 | 55993 | BH50151AS | 0'-6' | CADMIUM | 42 3 | | 1 | V | 0 64 | 0 88 | 1 12 | 1 36 |
| | 2462975 | 55993 | BH50161AS | 4 9.3 | CADMIUM | 39 9 | | 1 | V | 0 64 | 0 88 | 1 12 | 1 36 |
| | 2743730 | 58093 | BH50314AS | 0'-8' | CADMIUM | 26 7 | | 1 | V | 0 64 | 0 88 | 1 12 | 1.36 |
| | 5422759 | 55694 | BH00041AS | 0 0-6 0 | CADMIUM | 11 2 | N | 0 644 | Y | 0 64 | 0 88 | 1 12 | 1 36 |
| | 2743686 | 58093 | BH50315AS | 10' 12' | CADMIUM | 2 1 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1 36 |
| | 2462931 | 55993 | BH50162AS | 0' 2' | CADMIUM | 1 5 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1 36 |
| | 5422762 | 55694 | BH00042AS | 6 0-10 6 | CADMIUM | 1 4 | N | 0 655 | Y | 0 64 | 0 88 | 1 12 | 1 36 |
| | 5422783 | 55694 | BH00041AS | 0 0-6 0 | COPPER | 2520 | | 0 43 | Y | 12 59 | 25 36 | 38 13 | 50 9 |
| | 2462957 | 55993 | BH50151AS | 0'-6' | COPPER | 957 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2743734 | 58093 | BH50314AS | 0'-8' | COPPER | 880 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2462979 | 55993 | BH50161AS | 4 9.3 | COPPER | 755 | | 5 | V | 12 59 | 25.36 | 38 13 | 50 9 |
| | 5422786 | 55694 | BH00042AS | 6 0-10 6 | COPPER | 66 4 | | 0 437 | Y | 12 59 | 25.36 | 38 13 | 50 9 |
| | 2743738 | 58093 | BH50314AS | 0'-8' | NICKEL | 115 | | 8 | V | 19 81 | 40 37 | 60 93 | 81 49 |
| | 2462983 | 55993 | BH50161AS | 4 9.3 | NICKEL | 93 2 | | 8 | V | 19 81 | 40.37 | 60 93 | 81.49 |
| | 2462985 | 55993 | BH50161AS | 4 9.3 | SILVER | 311 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| | 2743740 | 58093 | BH50314AS | 0'-8' | SILVER | 106 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| | 2462963 | 55993 | BH50151AS | 0'-6' | SILVER | 53 3 | | 2 | V | 5 7 | 15 1 | 24.5 | 33 9 |
| | 5422835 | 55694 | BH00041AS | 0 0-6 0 | SILVER | 50 7 | | 0 644 | Y | 5 7 | 15 1 | 24.5 | 33 9 |
| 133 5 | 2358296 | 55193 | BH50099AS | 6'-8' | COPPER | 390 | | 5 | V | 12 59 | 25 36 | 38 13 | 50 9 |
| 142.11 | 1883223 | 50292 | BH50008AS | 0' 14.5' | CADMIUM | 1 8 | | 1 | JA | 0 64 | 0 88 | 1 12 | 1.36 |
| TDEM-1 | 5209212 | 55294 | BH00033AS | 12.0-15 2 | NICKEL | 355 | | 40 | JA | 19 81 | 40.37 | 60 93 | 81.49 |
| TDEM-2 | 5372394 | 55994 | BH00034AS | 0 0-6 0 | ANTIMONY | 16 3 | N | 0 497 | Y | 6.56 | 9 4 | 12 24 | 15.08 |
| | 5372409 | 55994 | BH00034AS | 0 0-6 0 | BERYLLIUM | 446 | | 0 248 | Y | 4 66 | 9 43 | 14.2 | 18 97 |
| | 5372414 | 55994 | BH00034AS | 0 0-6 0 | CADMIUM | 71 | | 0 745 | Y | 0 64 | 0 88 | 1 12 | 1.36 |
| | 5284171 | 56094 | BH00037AS | 0 0-6 0 | CADMIUM | 35 3 | | 5 | Y | 0 64 | 0 88 | 1 12 | 1.36 |
| | 5284199 | 56094 | BH00038AS | 6 0-12 0 | CADMIUM | 8 8 | | 5 | Y | 0 64 | 0 88 | 1 12 | 1 36 |
| | 5372417 | 55994 | BH00035AS | 6 0-11 2 | CADMIUM | 5 2 | | 0 734 | Y | 0 64 | 0 88 | 1 12 | 1 36 |
| | 5284255 | 56094 | BH00040AS | 18 0-22 0 | CADMIUM | 2 1 | | 5 | Y | 0 64 | 0 88 | 1 12 | 1.36 |
| | 5372438 | 55994 | BH00034AS | 0 0-6 0 | COPPER | 8850 | | 0 745 | Y | 12 59 | 25 36 | 38 13 | 50 9 |
| | 5284175 | 56094 | BH00037AS | 0 0-6 0 | COPPER | 1150 | | 25 | Y | 12 59 | 25 36 | 38 13 | 50 9 |
| | 5372441 | 55994 | BH00035AS | 6 0-11 2 | COPPER | 758 | | 0 734 | Y | 12 59 | 25 36 | 38 13 | 50.9 |
| | 5284203 | 56094 | BH00038AS | 6 0-12 0 | COPPER | 309 | | 25 | Y | 12 59 | 25.36 | 38 13 | 50.9 |
| | 5284259 | 56094 | BH00040AS | 18 0-22 0 | COPPER | 124 | | 25 | Y | 12.59 | 25 36 | 38 13 | 50.9 |
| | 5284231 | 56094 | BH00039AS | 12 0-18 0 | COPPER | 85 | | 25 | Y | 12.59 | 25 36 | 38 13 | 50.9 |
| | 5372471 | 55994 | BH00034AS | 0 0-6 0 | MOLYBDENUM | 65 1 | | 3 72 | Y | 15 39 | 24.4 | 33 41 | 42.42 |
| | 5372476 | 55994 | BH00034AS | 0 0-6 0 | NICKEL | 255 | EN | 2 98 | Y | 19 81 | 40 37 | 60 93 | 81.49 |
| | 5284184 | 56094 | BH00037AS | 0 0-6 0 | NICKEL | 93 | | 40 | Y | 19 81 | 40.37 | 60 93 | 81 49 |
| | 5372495 | 55994 | BH00034AS | 0 0-6 0 | SILVER | 209 | E | 0 993 | Y | 5 7 | 15 1 | 24.5 | 33 9 |
| | 5372498 | 55994 | BH00035AS | 6 0-11 2 | SILVER | 51 3 | E | 0 979 | Y | 5 7 | 15 1 | 24.5 | 33 9 |

These data are graphically displayed Figures 4-4a nd 4b.

# Table 4 5
## Summary of Radionuclide COCs Exceeding Background in Subsurface Soil

| IHSS/S t | Seque ID | Location | Sample No. | Depth Interval | Constituent | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exceeds th Background Mean but is less than Background Mean plus one Standard Deviation | | | | | | | | | | | | | |
| 115/196 | 2262673 | 50992 | BH50138AS | 0'-6 | U233234 | 1 7 | B | 0 005 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2689770 | 58693 | BH50349AS | 12 19 5 | U233234 | 1 645 | B | 0 021 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2695013 | 58593 | BH50347AS | 0'-6 | U233234 | 1 641 | | 0 045962 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262631 | 50892 | BH50123AS | 8 16 | U233234 | 1 6 | B | 0 02 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5068976 | 57594 | BH00082AS | 6 0-12 0 | U233234 | 1.51 | | 0 03 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262638 | 50892 | BH50121AS | 0'-6 | U233234 | 1.5 | B | 0 016 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2689784 | 58693 | BH50405AS | 25 5 29 5 | U233234 | 1.5 | B | 0 01 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671054 | 59793 | BH50486AS | 13 3 15 3 | U233234 | 1 4974 | | 0 0304 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671058 | 61293 | BH50505AS | 6' 10 6 | U233234 | 1 4867 | | 0 0544 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695034 | 58593 | BH50404AS | 12.5 18 1 | U233234 | 1 434 | | 0 058313 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671536 | 61293 | BH50508AS | 0' 2 | U233234 | 1 4322 | | 0 0261 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262659 | 50792 | BH50105AS | 0' 10 | U233234 | 1 4 | B | 0 02 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2642403 | 58393 | BH50343AS | 0'-6' | U233234 | 1 4 | B | 0 015 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671214 | 59593 | BH50554AS | 14.4 16 4 | U233234 | 1.3878 | | 0 0177 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671527 | 59593 | BH50540AS | 0' 2 | U233234 | 1.3299 | | 0.0209 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5069652 | 56694 | BH00096AS | 0 0-6 0 | U233234 | 1.322 | | 0 0157 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5011953 | 56694 | BH00122AS | 43 0-150 0 | U233234 | 1.32 | | 0 0251 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2262694 | 50692 | BH50087AS | 0'-6 | U233234 | 1.3 | B | 0 016 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2253001 | 50692 | BH50088AS | 6' 12 | U233234 | 1.3 | | 0 013 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262687 | 50992 | BH50140AS | 0' 16 | U233234 | 1.3 | B | 0 044 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5069644 | 56694 | BH00095AS | 0 0-6 0 | U233234 | 1 286 | | 0 0179 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671043 | 59293 | BH50441AS | 12' 18 9 | U233234 | 1.2769 | | 0 0212 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671042 | 59293 | BH50440AS | 6' 12 | U233234 | 1.2688 | | 0 0227 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671409 | 63193 | BH50617AS | 6' 12 | U233234 | 1.254 | | 0 0391 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695027 | 58593 | BH50403AS | 6' 12.5 | U233234 | 1.252 | | 0 084029 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671406 | 60993 | BH50588AS | 0'-6 | U233234 | 1.2378 | | 0 0216 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262680 | 50992 | BH50139AS | 6' 12 | U233234 | 1.2 | B | 0 027 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671407 | 61093 | BH50603AS | 6' 13 | U233234 | 1 1888 | | 0 0465 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671211 | 59593 | BH50552AS | 0'-6 | U233234 | 1 18155 | | 0 022 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671533 | 58693 | BH50644AS | 0' 2 | U233234 | 1 1507 | | 0 0243 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671210 | 59493 | BH50522AS | 12.9' 17 8 | U233234 | 1 1312 | | 0.0222 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5069636 | 56694 | BH00111AS | 0 0-35 0 | U233234 | 1 118 | | 0 0178 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5011945 | 56694 | BH00113AS | 43 0-150 0 | U233234 | 1 108 | | 0 0465 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2252994 | 50592 | BH50066AS | 0' 32 | U233234 | 1 1 | | 0 015 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5017732 | 57594 | BH00121AS | 24 0-105 0 | U233234 | 1 098 | | 0 0164 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5186001 | 59494 | BH00152AS | 0 0-5 9 | U233234 | 1 094 | | 0 0241 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671535 | 59293 | BH50444AS | 0' 2 | U233234 | 1 089 | | 0 0363 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671041 | 59293 | BH50439AS | 0'-6 | U233234 | 1 0885 | | 0 028 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5012726 | 57594 | BH00085AS | 18 0-23 0 | U233234 | 1 087 | | 0.0143 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671052 | 59793 | BH50484AS | 0' 7 3 | U233234 | 1 0815 | | 0 0257 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671206 | 59193 | BH50457AS | 2' 8 | U233234 | 1.07715 | | 0 0234 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5186041 | 59894 | BH00164AS | 19.9-31.9 | U233234 | 1 074 | | 0 0166 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671408 | 63193 | BH50616AS | 0'-6' | U233234 | 1 074 | | 0 0221 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5069668 | 56694 | BH00112AS | 0 0-41 0 | U233234 | 1 073 | | 0 0216 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671047 | 59393 | BH50477AS | 6' 8 | U233234 | 1 0705 | | 0 0179 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671053 | 59793 | BH50485AS | 5.3 11 3 | U233234 | 1 0659 | | 0 0257 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5069660 | 56694 | BH00098AS | 6 0-10 0 | U233234 | 1 063 | | 0 0139 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671537 | 59793 | BH50488AS | 0' 2 | U233234 | 1 0586 | | 0 0569 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671410 | 63193 | BH50618AS | 12 20 | U233234 | 1 0381 | | 0 0352 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671525 | 58593 | BH50427AS | 0' 2 | U233234 | 1 0261 | | 0 0543 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671531 | 59493 | BH50524AS | 4 2 | U233234 | 1 0234 | | 0 022 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671046 | 59393 | BH50476AS | 0'-6 | U233234 | 1 0051 | | 0 0233 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5112058 | 58294 | BH00050AS | 0 0-4 0 | U233234 | 1 005 | | 0 0244 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2252987 | 50692 | BH50089AS | 0' 14 | U233234 | 1 | | 0 046 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262652 | 50792 | BH50104AS | 0'-6 | U233234 | 1 | B | 0 012 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 4954843 | 58294 | BH00050AS | 0 0-4 0 | U233234 | 0.9946 | | 0 0452 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2253015 | 50392 | BH50016AS | 25 30 | U233234 | 0.98 | | 0 026 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5112050 | 57994 | BH00047AS | 0 0-6.3 | U233234 | 0 9612 | | 0 0174 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2642382 | 58693 | BH50417AS | 6' 12 | U233234 | 0 96 | B | 0 042 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671524 | 59393 | BH50465AS | 0' 2 | U233234 | 0 9536 | | 0 0262 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2253022 | 50392 | BH50015AS | 18 24 | U233234 | 0 91 | | 0 015 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5185985 | 57094 | BH00147AS | 0 0-40 0 | U233234 | 0 8814 | | 0.0328 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 5068968 | 58494 | BH00071AS | 6 0-9.5 | U233234 | 0 87 | | 0 02 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2425815 | 51092 | BH50153AS | 0'-6' | U233234 | 0 84 | | 0 1 | A | 0 779 | 1 711 | 2.643 | 3.575 |

# Table 4-5 (Contmued)

| IHSS/S t | Sequenc ID | Location | Sample No. | Depth Interval | Constituent | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5068975 | 57594 | BH00078AS | 0 0-6 0 | U233234 | 0 82 | | 0 02 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5112074 | 58794 | BH00054AS | 0 0-2 4 | U233234 | 0 8117 | | 0 0227 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2425823 | 51092 | BH50154AS | 0' 12 | U233234 | 0 81 | | 0 04 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 4954842 | 57994 | BH00047AS | 0 0-6.3 | U233234 | 0 7816 | | 0 0312 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262602 | 50492 | BH50037AS | 0'-6' | U235 | 0 068 | J | 0 033 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671543 | 58593 | BH50427AS | 0' 2 | U235 | 0 0662 | | 0 0305 | Y | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2642374 | 58693 | BH50348AS | 0'-6 | U235 | 0 066 | J | 0 039 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2262686 | 50992 | BH50140AS | 0' 16 | U235 | 0 064 | J | 0 028 | A | 0 022 | 0 068 | 0.114 | 0.16 |
| | 2695035 | 58593 | BH50404AS | 12.5 18 1 | U235 | 0 0638 | | 0 048526 | V | 0 022 | 0.068 | 0 114 | 0 16 |
| | 3671078 | 59793 | BH50486AS | 13 3 15 3 | U235 | 0 0632 | | 0 0186 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671551 | 58693 | BH50644AS | 0' 2 | U235 | 0.0627 | | 0 0243 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671415 | 61093 | BH50603AS | 6 13 | U235 | 0 0626 | | 0 0243 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671234 | 59493 | BH50522AS | 12.9 17 8 | U235 | 0 0622 | | 0 0176 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2253056 | 50592 | BH50063AS | 6' 12 | U235 | 0 061 | J | 0 022 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5068984 | 58494 | BH00068AS | 0 0-6 0 | U235 | 0 06 | | 0 01 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2253035 | 50392 | BH50013AS | 6' 12 | U235 | 0 058 | J | 0 028 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 5069653 | 56694 | BH00096AS | 0 0-6 0 | U235 | 0.05681 | | 0 0179 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2252993 | 50592 | BH50066AS | 0' 32 | U235 | 0 055 | J | 0 015 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3335594 | 58393 | BH50418AS | 19 5 21 5 | U235 | 0 054 | U | 0.2 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5017733 | 57594 | BH00121AS | 24 0-105 0 | U235 | 0 05395 | | 0 0124 | V | 0 022 | 0 068 | 0 114 | 0.16 |
| | 5186042 | 59894 | BH00164AS | 19 9-31 9 | U235 | 0 05001 | | 0 0202 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2642402 | 58393 | BH50343AS | 0'-6 | U235 | 0 05 | J | 0 04 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671416 | 63193 | BH50616AS | 0'-6 | U235 | 0 0499 | | 0 0175 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671235 | 59593 | BH50552AS | 0'-6 | U235 | 0 04975 | | 0 0174 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5011954 | 56694 | BH00122AS | 43 0-150 0 | U235 | 0.04971 | | 0 0215 | V | 0 022 | 0.068 | 0 114 | 0.16 |
| | 5185994 | 57094 | BH00148AS | 0 0-40 0 | U235 | 0 0494 | | 0.0464 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5112075 | 58794 | BH00054AS | 0 0-2 4 | U235 | 0 04938 | | 0.0227 | V | 0 022 | 0 068 | 0 114 | 0.16 |
| | 4954855 | 58694 | BH00052AS | 0 0-2.9 | U235 | 0 0491 | | 0.0201 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671555 | 59793 | BH50488AS | 0' 2 | U235 | 0 0477 | | 0 032 | Y | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2262644 | 50892 | BH50122AS | 6' 12 | U235 | 0 047 | J | 0 02 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671067 | 59293 | BH50441AS | 12' 18 9' | U235 | 0 0462 | | 0 0213 | Y | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2253042 | 50392 | BH50012AS | 0'-4.5 | U235 | 0 046 | J | 0 013 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671549 | 59493 | BH50524AS | 4 2 | U235 | 0 0449 | | 0 0221 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5069669 | 56694 | BH00112AS | 0 0-41 0 | U235 | 0 0427 | | 0 0175 | V | 0.022 | 0 068 | 0 114 | 0 16 |
| | 2642381 | 58693 | BH50417AS | 6' 12 | U235 | 0 041 | J | 0.02 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5012727 | 57594 | BH00085AS | 18 0-23 0 | U235 | 0.04041 | | 0 0186 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5068993 | 57594 | BH00082AS | 6 0-12 0 | U235 | 0 04 | | 0 02 | Y | 0 022 | 0 068 | 0 114 | 0.16 |
| | 5011946 | 56694 | BH00113AS | 43 0-150 0 | U235 | 0 03948 | | 0 0293 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 4954856 | 58794 | BH00054AS | 0 0-2 4 | U235 | 0 038 | | 0 0349 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2425816 | 51092 | BH50153AS | 0'-6 | U235 | 0 037 | U | 0 1 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5186026 | 59494 | BH00160AS | 11.9-17 9 | U235 | 0 03697 | | 0 0119 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5112051 | 57994 | BH00047AS | 0 0-6.3 | U235 | 0 0369 | | 0.0226 | V | 0 022 | 0 068 | 0 114 | 0.16 |
| | 3671542 | 59393 | BH50465AS | 0' 2 | U235 | 0 0367 | | 0.0208 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671071 | 59393 | BH50477AS | 6' 8 | U235 | 0 0365 | | 0 0179 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5069645 | 56694 | BH00095AS | 0 0-6 0 | U235 | 0 03605 | | 0 0251 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5185986 | 57094 | BH00147AS | 0 0-40 0 | U235 | 0 03358 | J | 0.0383 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671230 | 59193 | BH50457AS | 2 8 | U235 | 0.0324 | | 0 016 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5069637 | 56694 | BH00111AS | 0 0-35 0 | U235 | 0 03215 | | 0 0178 | V | 0.022 | 0 068 | 0 114 | 0 16 |
| | 2262679 | 50992 | BH50139AS | 6' 12 | U235 | 0.032 | J | 0 027 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2262609 | 50492 | BH50038AS | 6' 12 | U235 | 0.031 | J | 0 024 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2425824 | 51092 | BH50154AS | 0' 12 | U235 | 0 029 | J | 0.02 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 5186034 | 59894 | BH00162AS | 17 9-19 9 | U235 | 0 02872 | | 0 0203 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671553 | 59293 | BH50444AS | 0' 2 | U235 | 0 0283 | | 0 019 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2253000 | 50692 | BH50088AS | 6' 12 | U235 | 0 028 | J | 0 021 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5012735 | 57594 | BH00086AS | 24 0-60 0 | U235 | 0 02745 | | 0 023 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2262616 | 50492 | BH50039AS | 12 18 | U235 | 0 027 | U | 0 034 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 4954854 | 58294 | BH00050AS | 0 0-4 0 | U235 | 0 0264 | | 0 0277 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5186018 | 59494 | BH00159AS | 11 9-17 9 | U235 | 0 02591 | | 0 00701 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2695028 | 58593 | BH50403AS | 6' 12.5 | U235 | 0 02501 | J | 0 062254 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671066 | 59293 | BH50440AS | 6 12 | U235 | 0 0247 | | 0 0228 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5069661 | 56694 | BH00098AS | 6 0-10 0 | U235 | 0 02267 | | 0.0169 | V | 0 022 | 0.068 | 0 114 | 0 16 |
| | 3671089 | 59293 | BH50439AS | 0'-6 | U238 | 1 1067 | | 0 0242 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2262650 | 50792 | BH50104AS | 0'-6 | U238 | 1 1 | B | 0 005 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2262678 | 50992 | BH50139AS | 6' 12 | U238 | 1 1 | B | 0 027 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3335595 | 58393 | BH50418AS | 19 5 21 5 | U238 | 1 1 | | 0.2 | A | 0 733 | 1 109 | 1 485 | 1 861 |

## Table 4-5 (Contnued)

| IHSS/S t | Seque ce ID | Locatio | Sample No. | Depth Interval | Constituent | Result in PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3671254 | 59193 | BH50457AS | 2' 8 | U238 | 1 0743 | | 0 016 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 5185995 | 57094 | BH00148AS | 0 0-40 0 | U238 | 1 05 | | 0 0464 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671091 | 59293 | BH50441AS | 12' 18 9 | U238 | 1 0343 | | 0 0213 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 4954865 | 58294 | BH00050AS | 0 0-4 0 | U238 | 1 0285 | | 0 0277 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5112060 | 58294 | BH00050AS | 0 0-4 0 | U238 | 1 026 | | 0 016 | V | 0 733 | 1 109 | 1.485 | 1.861 |
| | 5011947 | 56694 | BH00113AS | 43 0-150 0 | U238 | 1 024 | | 0 0357 | V | 0 733 | 1 109 | 1 485 | 1.861 |
| | 5017734 | 57594 | BH00121AS | 24 0-105 0 | U238 | 1 006 | | 0 00702 | V | 0 733 | 1 109 | 1 485 | 1.861 |
| | 5185987 | 57094 | BH00147AS | 0 0-40 0 | U238 | 1 003 | | 0.0328 | V | 0 733 | 1 109 | 1 485 | 1.861 |
| | 5186043 | 59894 | BH00164AS | 19 9-31 9 | U238 | 1 003 | | 0.0286 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2253013 | 50392 | BH50016AS | 25 30 | U238 | 1 | B | 0 016 | A | 0 733 | 1 109 | 1.485 | 1 861 |
| | 2262615 | 50492 | BH50039AS | 12 18 | U238 | 1 | B | 0 022 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 3671101 | 59793 | BH50485AS | 5.3 11 3 | U238 | 0 99695 | | 0 0204 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671258 | 59493 | BH50522AS | 12.9' 17 8 | U238 | 0.9901 | | 0 0176 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671426 | 63193 | BH50618AS | 12 20 | U238 | 0 9872 | | 0 0198 | Y | 0 733 | 1 109 | 1.485 | 1 861 |
| | 3671561 | 58593 | BH50427AS | 0' 2 | U238 | 0 9806 | | 0 0305 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671560 | 59393 | BH50465AS | 0' 2 | U238 | 0 9621 | | 0 0208 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671094 | 59393 | BH50476AS | 0'-6 | U238 | 0 9601 | | 0 0185 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2253048 | 50592 | BH50062AS | 0'-6 | U238 | 0.96 | B | 0 024 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2253062 | 50592 | BH50064AS | 12 18 | U238 | 0 96 | B | 0 019 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5069662 | 56694 | BH00098AS | 6 0-10 0 | U238 | 0 9555 | | 0 0118 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2262622 | 50492 | BH50040AS | 18 24 | U238 | 0 94 | B | 0 011 | A | 0 733 | 1 109 | 1.485 | 1 861 |
| | 5069000 | 58494 | BH00071AS | 6 0-9.5 | U238 | 0 91 | | 0 02 | Y | 0 733 | 1 109 | 1.485 | 1 861 |
| | 5112052 | 57994 | BH00047AS | 0 0-6.3 | U238 | 0 8997 | | 0 0174 | V | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2425825 | 51092 | BH50154AS | 0' 12 | U238 | 0 87 | | 0 02 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671100 | 59793 | BH50484AS | 0' 7 3 | U238 | 0 868 | | 0 0204 | Y | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2253069 | 50592 | BH50065AS | 18 24 | U238 | 0 86 | B | 0.009 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2425817 | 51092 | BH50153AS | 0'-6 | U238 | 0 86 | | 0 1 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 3671095 | 59393 | BH50477AS | 6' 8 | U238 | 0 854 | | 0.0179 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2253076 | 50492 | BH50041AS | 30' 38 | U238 | 0 84 | B | 0.013 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 5112076 | 58794 | BH00054AS | 0 0-2 4 | U238 | 0 8314 | | 0.0195 | V | 0 733 | 1 109 | 1.485 | 1.861 |
| | 5186011 | 59494 | BH00155AS | 5 9-11.9 | U238 | 0 8124 | | 0.0187 | V | 0 733 | 1 109 | 1.485 | 1.861 |
| | 4954866 | 58694 | BH00052AS | 0 0-2.9 | U238 | 0 8072 | | 0.0201 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 4954867 | 58794 | BH00054AS | 0 0-2 4 | U238 | 0 8068 | | 0 0349 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2262601 | 50492 | BH50037AS | 0'-6 | U238 | 0 8 | B | 0 033 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 5069007 | 57594 | BH00078AS | 0 0-6 0 | U238 | 0 8 | | 0 01 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2253041 | 50392 | BH50012AS | 0'-4.5 | U238 | 0 79 | B | 0 013 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5068999 | 58494 | BH00068AS | 0 0-6 0 | U238 | 0 79 | | 0 01 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2262608 | 50492 | BH50038AS | 6' 12 | U238 | 0 76 | B | 0 014 | A | 0 733 | 1 109 | 1.485 | 1 861 |
| | 5112068 | 58694 | BH00052AS | 0 0-2 9 | U238 | 0 7421 | | 0 0265 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5186035 | 59894 | BH00162AS | 17 9-19 9 | U238 | 0 7367 | | 0 0309 | V | 0 733 | 1 109 | 1 485 | 1.861 |
| 133 1 | 2550476 | 56493 | BH50219AS | 0'-6 | U233234 | 1.5 | B | 0.017 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2525792 | 56293 | BH50206AS | 0'-6 | U233234 | 1 441 | | 0.052 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439080 | 56193 | BH50176AS | 0' 2 | U233234 | 1 1 | B | 0 011 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439108 | 56193 | BH50304AS | 18 25 | U233234 | 1 | B | 0 01 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2550469 | 56493 | BH50220AS | 0' 2 | U233234 | 0.95 | B | 0 019 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2525785 | 56293 | BH50210AS | 0' 2 | U233234 | 0 9302 | | 0 037 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671045 | 58893 | BH50459AS | 6' 12 | U233234 | 0.9009 | | 0 024 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439087 | 56193 | BH50177AS | 0'-6 | U233234 | 0 89 | B | 0.021 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3335579 | 58893 | BH50646AS | 0' 2 | U233234 | 0 88 | | 0.2 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439094 | 56193 | BH50178AS | 6' 11 4 | U233234 | 0 8 | B | 0 013 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439101 | 56193 | BH50303AS | 12 18 | U233234 | 0 79 | B | 0.017 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2550468 | 56493 | BH50220AS | 0' 2 | U235 | 0 068 | J | 0 019 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2439079 | 56193 | BH50176AS | 0' 2 | U235 | 0 054 | J | 0 011 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671068 | 58893 | BH50458AS | 0'-6 | U235 | 0 0366 | | 0 0207 | Y | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2525800 | 56293 | BH50207AS | 6' 10 | U235 | 0 03042 | J | 0 043 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671069 | 58893 | BH50459AS | 6' 12 | U235 | 0 0223 | | 0 0164 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2525801 | 56293 | BH50207AS | 6' 10' | U238 | 1 1085 | | 0 057 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2439085 | 56193 | BH50177AS | 0'-6' | U238 | 1 1 | B | 0.021 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2439106 | 56193 | BH50304AS | 18 25 | U238 | 1 1 | B | 0 01 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2439092 | 56193 | BH50178AS | 6' 11 4 | U238 | 1 1 | B | 0 022 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3335581 | 58893 | BH50646AS | 0' 2 | U238 | 0 97 | | 0.2 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2439099 | 56193 | BH50303AS | 12 18 | U238 | 0 91 | B | 0 053 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2550460 | 56193 | BH50305AS | 23 30 | U238 | 0 82 | B | 0 015 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| 133.2 | 2625468 | 57193 | BH50246AS | 0' 2 | U233234 | 1 625 | | 0 116367 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522237 | 57293 | BH50251AS | 0' 2 | U233234 | 1.6 | B | 0 013 | A | 0 779 | 1 711 | 2.643 | 3.575 |

## Table 4 5 (Contınued)

| IHSS/S t | Sequen ID | Locatio | Sampl No. | Depth Interval | Constituent | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2522258 | 57293 | BH50254AS | 12 18 | U233234 | 1 6 | B | 0 017 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2550609 | 57493 | BH50261AS | 0' 2 | U233234 | 1 5 | B | 0 014 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2625475 | 57193 | BH50247AS | 0' 5 5 | U233234 | 1 499 | | 0 066429 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467547 | 56993 | BH50202AS | 8.1 14 | U233234 | 1 48 | | 0 033 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522286 | 57393 | BH50257AS | 0'-6.6 | U233234 | 1 4 | B | 0 029 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522307 | 57393 | BH50260AS | 16 1 24 1 | U233234 | 1 4 | B | 0 012 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522314 | 57393 | BH50291AS | 22.1 26 1 | U233234 | 1 4 | B | 0 014 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522293 | 57393 | BH50258AS | 4 6 12 1 | U233234 | 1 4 | B | 0 013 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3670886 | 58793 | BH50406AS | 0'-6.1 | U233234 | 1.3926 | | 0 0284 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2465693 | 57593 | BH50299AS | 0'-6 | U233234 | 1 3 | B | 0 047 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522265 | 57293 | BH50255AS | 20' 26 | U233234 | 1.2 | B | 0 022 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2550616 | 57493 | BH50262AS | 0'-6 | U233234 | 1 2 | B | 0 039 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467542 | 57093 | BH50242AS | 0'-6 | U233234 | 1 18 | | 0 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671538 | 58793 | BH50645AS | 0' 2 | U233234 | 1 1409 | | 0 0314 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3670887 | 58793 | BH50407AS | 6.1 12 | U233234 | 1 1229 | | 0 0285 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467543 | 57093 | BH50241AS | 0' 2 | U233234 | 1 11 | | 0 013 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2625489 | 57193 | BH50250AS | 7' 13 | U233234 | 1 107 | | 0 096004 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522300 | 57393 | BH50259AS | 10 2 18 1 | U233234 | 1 1 | B | 0 014 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2550455 | 57493 | BH50265AS | 18 20 | U233234 | 1 1 | B | 0 017 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2465686 | 57593 | BH50298AS | 0' 2 | U233234 | 1 1 | B | 0 041 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2465714 | 57593 | BH50301AS | 12 14 | U233234 | 1 1 | B | 0 01 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2465700 | 57593 | BH50300AS | 6' 12 | U233234 | 1 1 | B | 0.014 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2624779 | 56893 | BH50236AS | 0' 2 | U233234 | 1 077 | | 0 049377 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2525820 | 56893 | BH50240AS | 14.3 20 3 | U233234 | 1 02595 | | 0 044 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3670889 | 58793 | BH50409AS | 18 24 | U233234 | 1 009 | | 0 0285 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522279 | 57393 | BH50256AS | 0' 2 | U233234 | 1 | B | 0 012 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3670890 | 58793 | BH50410AS | 24 28 4 | U233234 | 0 9837 | | 0 0178 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3670888 | 58793 | BH50408AS | 12 18 | U233234 | 0 9751 | | 0 0176 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2465707 | 57593 | BH50294AS | 6' 12 | U233234 | 0 97 | B | 0 014 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467541 | 57093 | BH50243AS | 6' 12.3 | U233234 | 0 956 | | 0.014 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467546 | 56993 | BH50199AS | 0'-4 | U233234 | 0 932 | | 0.026 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2525813 | 56893 | BH50239AS | 8.3 14 3 | U233234 | 0 9233 | | 0 046 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467537 | 57093 | BH50276AS | 30 7' 36 1 | U233234 | 0 803 | | 0 013 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467506 | 56993 | BH50202AS | 8 1 14 | U235 | 0 0641 | | 0 023 | V | 0.022 | 0.068 | 0 114 | 0 16 |
| | 2465706 | 57593 | BH50294AS | 6' 12 | U235 | 0 061 | J | 0.036 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522236 | 57293 | BH50251AS | 0' 2 | U235 | 0 06 | BJ | 0 022 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2467514 | 57093 | BH50245AS | 18.6 24 | U235 | 0 0524 | | 0 013 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2467507 | 56993 | BH50204AS | 20 7' 26 7' | U235 | 0 0502 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2467515 | 57093 | BH50243AS | 6' 12.3 | U235 | 0 0481 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2525821 | 56893 | BH50240AS | 14.3 20 3 | U235 | 0 046647 | | 0 044 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2625476 | 57193 | BH50247AS | 0' 5 5 | U235 | 0 04503 | J | 0 068914 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3670913 | 58793 | BH50409AS | 18 24 | U235 | 0 045 | | 0 0195 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522250 | 57293 | BH50253AS | 6' 12 | U235 | 0 044 | BJ | 0 012 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671556 | 58793 | BH50645AS | 0' 2 | U235 | 0 044 | | 0 025 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3670912 | 58793 | BH50408AS | 12 18 | U235 | 0 0431 | | 0 0177 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522264 | 57293 | BH50255AS | 20 26 | U235 | 0 042 | BJ | 0 034 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3670911 | 58793 | BH50407AS | 6.1 12 | U235 | 0 0389 | | 0 0195 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2467517 | 56993 | BH50203AS | 14.3 20 7 | U235 | 0 0374 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2467504 | 56993 | BH50198AS | 0' 2 | U235 | 0 0367 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522299 | 57393 | BH50259AS | 10 2 18 1 | U235 | 0 034 | BJ | 0.014 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2550608 | 57493 | BH50261AS | 0' 2 | U235 | 0 034 | J | 0 014 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2467513 | 57093 | BH50276AS | 30 7' 36 1 | U235 | 0 0334 | | 0 013 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3670910 | 58793 | BH50406AS | 0'-6.1 | U235 | 0 0317 | | 0 0194 | Y | 0 022 | 0.068 | 0 114 | 0 16 |
| | 3670914 | 58793 | BH50410AS | 24 28 4 | U235 | 0 0291 | | 0 0179 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522278 | 57393 | BH50256AS | 0' 2 | U235 | 0 029 | BJ | 0 012 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2465699 | 57593 | BH50300AS | 6' 12 | U235 | 0 028 | U | 0 044 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2467510 | 57093 | BH50275AS | 24 30 7 | U235 | 0 0279 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2550628 | 57493 | BH50264AS | 12 18 | U238 | 1 1 | B | 0 016 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2467564 | 57093 | BH50241AS | 0' 2 | U238 | 1 03 | | 0 | V | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2550614 | 57493 | BH50262AS | 0'-6 | U238 | 1 | B | 0 071 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2465712 | 57593 | BH50301AS | 12 14 | U238 | 1 | B | 0 01 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2465684 | 57593 | BH50298AS | 0' 2 | U238 | 0 98 | B | 0 016 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2522277 | 57393 | BH50256AS | 0' 2 | U238 | 0 97 | B | 0 012 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2525822 | 56893 | BH50240AS | 14.3 20 3 | U238 | 0 96475 | | 0 057 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3670936 | 58793 | BH50408AS | 12 18 | U238 | 0.9464 | | 0 0223 | Y | 0 733 | 1 109 | 1 485 | 1 861 |

# Table 4-5 (Contnued)

| IHSS/S t | Seque ce ID | Location | Sampl No | Depth Interval | Constitue t | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3670938 | 58793 | BH50410AS | 24' 28 4 | U238 | 0 9037 | | 0 0179 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2550621 | 57493 | BH50263AS | 6' 12 | U238 | 0 82 | B | 0 024 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2467549 | 56993 | BH50198AS | 0' 2 | U238 | 0 779 | | 0 014 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| 133.3 | 2439129 | 56593 | BH50221AS | 0' 2 | U233234 | 1 6 | B | 0 06 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671220 | 63093 | BH50559AS | 15 20 | U233234 | 1 5392 | | 0 0478 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2439115 | 56693 | BH50226AS | 0' 2 | U233234 | 1 4 | B | 0 011 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671215 | 59693 | BH50556AS | 0'-6 | U233234 | 1.3268 | | 0 0245 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2550490 | 56793 | BH50233AS | 6' 12 | U233234 | 1.3 | B | 0 027 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671218 | 59693 | BH50557AS | 6' 12 | U233234 | 1 2384 | | 0 0282 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439143 | 56593 | BH50223AS | 6' 12 | U233234 | 1 2 | B | 0 11 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2439122 | 56693 | BH50227AS | 0'-6 | U233234 | 1 2 | B | 0 035 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439136 | 56593 | BH50222AS | 0'-6 | U233234 | 1 1 | B | 0 011 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3335586 | 61393 | BH50650AS | 0' 2 | U233234 | 1 | | 0 1 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671224 | 61493 | BH50583AS | 0' 8 5 | U233234 | 0 9959 | | 0 0291 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2550504 | 56793 | BH50232AS | 0'-6 | U233234 | 0 99 | B | 0 016 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671221 | 61393 | BH50570AS | 0'-6 | U233234 | 0 98865 | | 0 0219 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671222 | 61393 | BH50576AS | 0' 10 | U233234 | 0.9853 | | 0 0178 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3335607 | 61493 | BH50651AS | 0' 2 | U233234 | 0 93 | | 0.2 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671056 | 61193 | BH50503AS | 6' 10 | U233234 | 0 89635 | | 0 0165 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2625482 | 56593 | BH50224AS | 13 17 | U233234 | 0 8024 | | 0 062641 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671225 | 61493 | BH50585AS | 8.5 15 9' | U233234 | 0 7885 | | 0.0259 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2550503 | 56793 | BH50232AS | 0'-6 | U235 | 0 058 | J | 0 016 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671239 | 59693 | BH50556AS | 0'-6 | U235 | 0 0547 | | 0 0195 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671249 | 61493 | BH50585AS | 8.5 15 9 | U235 | 0 0529 | | 0 0205 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671245 | 61393 | BH50570AS | 0'-6' | U235 | 0.0496 | | 0 0174 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671248 | 61493 | BH50583AS | 0' 8 5 | U235 | 0 04935 | | 0 0179 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2439121 | 56693 | BH50227AS | 0'-6 | U235 | 0 048 | J | 0 013 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671080 | 61193 | BH50503AS | 6' 10 | U235 | 0 0438 | | 0 0165 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671250 | 61493 | BH50584AS | 5.5 13 5 | U235 | 0 0399 | | 0 0206 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671243 | 59693 | BH50558AS | 12' 15 5 | U235 | 0 0388 | | 0 0226 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671244 | 63093 | BH50559AS | 15 20' | U235 | 0 03265 | | 0 0293 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2550486 | 56793 | BH50234AS | 10' 12 | U235 | 0 03 | J | 0 023 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2625483 | 56593 | BH50224AS | 13 17' | U235 | 0 02713 | J | 0.066717 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3335588 | 61393 | BH50650AS | 0' 2 | U238 | 1 1 | | 0 1 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3335609 | 61493 | BH50651AS | 0' 2 | U238 | 1 1 | | 0 1 | A | 0 733 | 1 109 | 1.485 | 1 861 |
| | 3671266 | 59693 | BH50557AS | 6' 12 | U238 | 1 0966 | | 0.0283 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671270 | 61393 | BH50576AS | 0' 10 | U238 | 1 0892 | | 0 0178 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2625484 | 56593 | BH50224AS | 13 17 | U238 | 1 034 | | 0 043704 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671104 | 61193 | BH50503AS | 6' 10 | U238 | 0 9435 | | 0 0165 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671268 | 63093 | BH50559AS | 15 20 | U238 | 0 922 | | 0 0293 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671273 | 61493 | BH50585AS | 8.5 15 9 | U238 | 0 9084 | | 0 0205 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671267 | 59693 | BH50558AS | 12' 15 5 | U238 | 0 80475 | | 0 0226 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2550485 | 56793 | BH50234AS | 10 12 | U238 | 0 79 | B | 0 023 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| 133.4 | 2525869 | 55993 | BH50162AS | 0' 2 | U233234 | 1.6 | | 0 032 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439059 | 55593 | BH50059AS | 12 18 | U233234 | 1.5 | B | 0 02 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439073 | 55593 | BH50083AS | 24 26 | U233234 | 1.5 | B | 0 018 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2653841 | 55793 | BH50307AS | 0'-6 | U233234 | 1 484 | | 0 070402 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522230 | 55593 | BH50057AS | 0'-6 | U233234 | 1 4 | B | 0 012 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2439052 | 55593 | BH50058AS | 6' 12 | U233234 | 1 4 | B | 0 048 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2439066 | 55593 | BH50082AS | 18 24 | U233234 | 1.3 | B | 0 019 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671529 | 59093 | BH50648AS | 0' 2 | U233234 | 1.2966 | | 0 0292 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2653774 | 55693 | BH50101AS | 6' 12 | U233234 | 1 246 | | 0 068371 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2525771 | 55893 | BH50141AS | 0' 2 | U233234 | 1.242 | | 0 045 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2653855 | 55693 | BH50113AS | 18' 24 5 | U233234 | 1 23 | | 0 08605 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2525778 | 55893 | BH50149AS | 0'-6 | U233234 | 1 138 | | 0 045 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2525764 | 55993 | BH50187AS | 9 3 15 | U233234 | 1 12 | | 0 029 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671040 | 59093 | BH50413AS | 12' 16 3 | U233234 | 1 0768 | | 0 0206 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2653781 | 55693 | BH50102AS | 12 18 | U233234 | 1 013 | | 0 039622 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2695396 | 58093 | BH50313AS | 0' 2 | U233234 | 0 962 | | 0 034 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2653862 | 55793 | BH50310AS | 18 4 22 4 | U233234 | 0.9452 | | 0 152185 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671039 | 59093 | BH50412AS | 6' 12 | U233234 | 0 8874 | | 0 0284 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2653869 | 55793 | BH50309AS | 12.4 18 4 | U233234 | 0 8694 | | 0 134509 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2439065 | 55593 | BH50082AS | 18 24 | U235 | 0 068 | J | 0 019 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2525856 | 56093 | BH50271AS | 2' 8 | U235 | 0 068 | | 0 037 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671062 | 59093 | BH50411AS | 0'-6 | U235 | 0 0679 | | 0.0187 | Y | 0 022 | 0 068 | 0 114 | 0 16 |

## Table 4 5 (Contınued)

| IHSS/S t | Seque ID | Locatıo | Sample No. | Depth Interval | Constituent | Result in PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2653768 | 55693 | BH50100AS | 0'-6 | U235 | 0 06624 | J | 0 101381 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2653856 | 55693 | BH50113AS | 18' 24 5 | U235 | 0 05969 | J | 0 08605 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2439058 | 55593 | BH50059AS | 12 18 | U235 | 0 057 | J | 0 012 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2695362 | 58093 | BH50313AS | 0' 2 | U235 | 0 0544 | | 0 012 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2653842 | 55793 | BH50307AS | 0'-6 | U235 | 0 05322 | J | 0 0671 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2525779 | 55893 | BH50149AS | 0'-6 | U235 | 0 051 | | 0 038 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2525772 | 55893 | BH50141AS | 0' 2 | U235 | 0 04773 | | 0 047 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2525870 | 55993 | BH50162AS | 0' 2 | U235 | 0 04672 | | 0 032 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2653782 | 55693 | BH50102AS | 12 18 | U235 | 0 04228 | | 0 039622 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2653775 | 55693 | BH50101AS | 6' 12 | U235 | 0 03611 | J | 0 062515 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671064 | 59093 | BH50413AS | 12 16 3 | U235 | 0 0355 | | 0 0163 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2525765 | 55993 | BH50187AS | 9 3 15 | U235 | 0 03232 | | 0 029 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2653870 | 55793 | BH50309AS | 12.4 18 4 | U235 | 0 02892 | J | 0 115726 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2653863 | 55793 | BH50310AS | 18 4 22 4 | U235 | 0 02519 | J | 0 122162 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2439072 | 55593 | BH50083AS | 24 26 | U235 | 0 025 | J | 0 01 | A | 0.022 | 0 068 | 0 114 | 0 16 |
| | 2525780 | 55893 | BH50149AS | 0'-6 | U238 | 1 107 | | 0 045 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2439064 | 55593 | BH50082AS | 18 24 | U238 | 1 1 | B | 0 012 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671088 | 59093 | BH50413AS | 12 16 3 | U238 | 1 0812 | | 0 0163 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2653871 | 55793 | BH50309AS | 12 4 18 4 | U238 | 1 041 | | 0 13171 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2653864 | 55793 | BH50310AS | 18 4 22 4 | U238 | 1 012 | | 0 131379 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671087 | 59093 | BH50412AS | 6' 12 | U238 | 0 8945 | | 0 0174 | Y | 0 733 | 1 109 | 1.485 | 1.861 |
| | 3671086 | 59093 | BH50411AS | 0'-6 | U238 | 0 8053 | | 0 0187 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| 133.5 | 2451950 | 55293 | BH50106AS | 0'-6 | U233234 | 1 7 | B | 0 017 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451936 | 55193 | BH50090AS | 0'-6' | U233234 | 1.5 | B | 0.015 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451943 | 55193 | BH50099AS | 6'-8 | U233234 | 1.3 | B | 0 029 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2420060 | 55493 | BH50033AS | 6' 12.4 | U233234 | 1.23 | | 0 018 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451957 | 55293 | BH50107AS | 6' 10' | U233234 | 1 | B | 0 01 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451935 | 55193 | BH50090AS | 0'-6 | U235 | 0 053 | J | 0 035 | A | 0.022 | 0 068 | 0 114 | 0 16 |
| | 2420028 | 55493 | BH50034AS | 12.4 19 3 | U235 | 0 0477 | | 0 01 | V | 0.022 | 0 068 | 0 114 | 0 16 |
| | 2420026 | 55393 | BH50164AS | 6' 12 | U235 | 0 0382 | | 0 | V | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2420016 | 55393 | BH50165AS | 12' 17 2 | U235 | 0 03505 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2420027 | 55493 | BH50169AS | 22.3 30 2 | U235 | 0 024 | | 0 015 | V | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2467511 | 55393 | BH50116AS | 18.2 23 8 | U235 | 0 0236 | | 0 018 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2451955 | 55293 | BH50107AS | 6' 10 | U238 | 0.97 | B | 0 01 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| 133 6 | 2451999 | 54993 | BH50042AS | 6' 10 | U233234 | 1.5 | B | 0 011 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451978 | 54893 | BH50017AS | 0'-6 5 | U233234 | 1 4 | B | 0 016 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451985 | 54893 | BH50031AS | 4.4 12 | U233234 | 1 4 | B | 0 012 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451992 | 54993 | BH50035AS | 0'-6 | U233234 | 1.3 | B | 0 01 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451971 | 55093 | BH50131AS | 6' 13 2 | U233234 | 1 1 | B | 0 02 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451964 | 55093 | BH50060AS | 0'-6 | U233234 | 1 | B | 0 026 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2451970 | 55093 | BH50131AS | 6' 13 2 | U235 | 0 048 | J | 0.008 | A | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2451963 | 55093 | BH50060AS | 0'-6 | U235 | 0 045 | J | 0 008 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2451998 | 54993 | BH50042AS | 6' 10 | U235 | 0 04 | BJ | 0 011 | A | 0 022 | 0.068 | 0 114 | 0.16 |
| | 2451962 | 55093 | BH50060AS | 0'-6' | U238 | 1 1 | B | 0 032 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| 142.10 | 2262666 | 51193 | BH50168AS | 0' 10' | U233234 | 1 | B | 0 005 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2045287 | 50092 | BH50000AS | 0' 14.8 | U233234 | 0 8288 | | 0 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2262665 | 51193 | BH50168AS | 0' 10 | U235 | 0 065 | J | 0 012 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2262664 | 51193 | BH50168AS | 0' 10' | U238 | 1 1 | B | 0 005 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2045289 | 50092 | BH50000AS | 0' 14.8 | U238 | 0 9557 | | 0 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| 142.11 | 2045303 | 50292 | BH50008AS | 0' 14.5 | U233234 | 0 8856 | | 0 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| Concret Pad | 5112082 | 56194 | BH00043AS | 0 0-6 0 | U233234 | 1 014 | | 0 0171 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 4954841 | 56194 | BH00043AS | 0 0-6 0 | U233234 | 0 8961 | | 0.0228 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5112083 | 56194 | BH00043AS | 0 0-6 0 | U235 | 0 05152 | | 0 0223 | V | 0.022 | 0 068 | 0 114 | 0 16 |
| | 4954852 | 56194 | BH00043AS | 0 0-6 0 | U235 | 0 0465 | | 0 0228 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| Magnetı Anomaly W of 133 | 3671430 | 64693 | BH50638AS | 0'-6 | U233234 | 1 419 | | 0 0254 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3335628 | 64693 | BH50654AS | 0' 2 | U233234 | 1 4 | | 0.2 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671433 | 64593 | BH50634AS | 0'-6 | U233234 | 1.3243 | | 0 0183 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3335621 | 64593 | BH50653AS | 0' 2 | U233234 | 1.3 | | 0 2 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671435 | 64593 | BH50636AS | 12 18 | U233234 | 1.2928 | | 0 0218 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671431 | 64693 | BH50639AS | 6' 12 | U233234 | 1.2445 | | 0 029 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671432 | 64693 | BH50640AS | 12 16 | U233234 | 1.2145 | | 0 026 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3335614 | 64493 | BH50652AS | 0' 2 | U233234 | 1.2 | | 0.2 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671434 | 64593 | BH50635AS | 6' 12 | U233234 | 1 1822 | | 0 0313 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671436 | 64593 | BH50637AS | 18 20' | U233234 | 1 1003 | | 0 0318 | Y | 0 779 | 1 711 | 2.643 | 3.575 |

# Table 4-5 (Contnued)

| IHSS/S t | Seque ID | Locatio | Sample No | Depth Interval | Constitue t | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3671437 | 64493 | BH50630AS | 0'-6' | U233234 | 1 0744 | | 0 0208 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671438 | 64493 | BH50631AS | 6' 12 | U233234 | 0 9867 | | 0 0342 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3335629 | 64693 | BH50654AS | 0' 2 | U235 | 0 067 | U | 0 1 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 3671454 | 64593 | BH50636AS | 12 18 | U235 | 0 0534 | | 0 0219 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 3671452 | 64593 | BH50634AS | 0'-6 | U235 | 0 0499 | | 0 0184 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 3671457 | 64493 | BH50631AS | 6' 12 | U235 | 0 0331 | | 0 0271 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 3671456 | 64493 | BH50630AS | 0'-6' | U235 | 0 0311 | | 0.0208 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 3671453 | 64593 | BH50635AS | 6' 12 | U235 | 0 0269 | | 0 0248 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 3671450 | 64693 | BH50639AS | 6' 12 | U235 | 0 0269 | | 0 0199 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 3335630 | 64693 | BH50654AS | 0' 2 | U238 | 1 1 | | 0 1 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671472 | 64593 | BH50635AS | 6' 12 | U238 | 1 034 | | 0 0248 | Y | 0 733 | 1 109 | 1.485 | 1.861 |
| S133 | 3335600 | 57793 | BH50329AS | 0' 2 | U233234 | 1.5 | | 0.2 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671526 | 57893 | BH50355AS | 0' 2 | U233234 | 1.2179 | | 0 0443 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695402 | 57993 | BH50320AS | 0'-6 | U233234 | 0 866 | | 0 047 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671530 | 57993 | BH50643AS | 0' 2 | U233234 | 0 8516 | | 0 0236 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695398 | 57793 | BH50322AS | 6.3 12 | U233234 | 0 794 | | 0 06 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671548 | 57993 | BH50643AS | 0' 2 | U235 | 0 048 | | 0 0236 | Y | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2695358 | 57793 | BH50321AS | 0' 5 75 | U235 | 0 0427 | | 0 012 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 2695370 | 57793 | BH50323AS | 12.2 18 2 | U235 | 0 0382 | | 0 022 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 3671544 | 57893 | BH50355AS | 0' 2 | U235 | 0 037 | | 0 0303 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 2725144 | 57793 | BH50338AS | 24 28 9 | U235 | 0 0353 | | 0 019 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 2695359 | 57993 | BH50320AS | 0'-6' | U235 | 0 035 | | 0 03 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 2725145 | 57893 | BH50339AS | 0'-6 | U235 | 0 0321 | | 0 022 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 2725147 | 57893 | BH50341AS | 12.4 17 8 | U235 | 0 0309 | | 0 021 | A | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2725142 | 57793 | BH50324AS | 18.8 24 4 | U235 | 0 02965 | | 0.02 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 2725157 | 57893 | BH50342AS | 18.7' 26 4 | U235 | 0 0288 | | 0.026 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 2725146 | 57893 | BH50340AS | 6' 12.4 | U235 | 0 0229 | | 0 021 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 2695418 | 57793 | BH50322AS | 6 3 12 | U238 | 1 06 | | 0 021 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 3335602 | 57793 | BH50329AS | 0' 2 | U238 | 1 | | 0 1 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 3671566 | 57993 | BH50643AS | 0' 2 | U238 | 0 8516 | | 0 0236 | Y | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2695423 | 57993 | BH50320AS | 0'-6' | U238 | 0 845 | | 0 024 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| TDEM 1 | 5362681 | 55194 | BH00029AS | 6 0-12.0 | U233234 | 1 71 | | 0.0252 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5362713 | 55294 | BH00033AS | 12.0-15.2 | U233234 | 1 457 | | 0 0167 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5362689 | 55194 | BH00030AS | 12 0-16 1 | U233234 | 1 445 | | 0.017 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5362697 | 55294 | BH00031AS | 0 0-6 0 | U233234 | 1 429 | | 0 0127 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5362705 | 55294 | BH00032AS | 6 0-12 0 | U233234 | 1.25 | | 0 0201 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5012752 | 60094 | BH00089AS | 0 0-5 0 | U233234 | 0 8786 | | 0 0287 | V | 0 779 | 1 711 | 2 643 | 3.575 |
| | 5362714 | 55294 | BH00033AS | 12 0-15 2 | U235 | 0 05756 | | 0.0143 | Y | 0.022 | 0 068 | 0 114 | 016 |
| | 5362698 | 55294 | BH00031AS | 0 0-6 0 | U235 | 0 05567 | | 0 0114 | Y | 0 022 | 0 068 | 0 114 | 016 |
| | 5012753 | 60094 | BH00089AS | 0 0-5 0 | U235 | 0 05098 | | 0 0197 | V | 0 022 | 0 068 | 0 114 | 016 |
| | 5362706 | 55294 | BH00032AS | 6 0-12 0 | U235 | 0 0491 | | 0.0172 | Y | 0 022 | 0.068 | 0 114 | 016 |
| | 5362690 | 55194 | BH00030AS | 12 0-16 1 | U235 | 0 0375 | | 0.0159 | Y | 0 022 | 0.068 | 0 114 | 016 |
| TDEM 2 | 5292586 | 56094 | BH00039AS | 12 0-18 0 | U233234 | 1.23 | | 0.0217 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 4954840 | 55894 | BH00036AS | 0 0-6 0 | U233234 | 1 0095 | | 0.0238 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5112042 | 55894 | BH00036AS | 0 0-6 0 | U233234 | 0 8552 | | 0 023 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 4954851 | 55894 | BH00036AS | 0 0-6 0 | U235 | 0 0584 | | 0 0301 | V | 0 022 | 0 068 | 0 114 | 016 |
| | 5112043 | 55894 | BH00036AS | 0 0-6 0 | U235 | 0 05301 | | 0 0128 | V | 0 022 | 0 068 | 0 114 | 016 |
| | 5292587 | 56094 | BH00039AS | 12 0-18 0 | U235 | 0 03363 | | 0 0186 | Y | 0 022 | 0 068 | 0 114 | 016 |
| TDEM W133 | 5068966 | 58894 | BH00064AS | 0 0-2 7 | U233234 | 1 11 | | 0 01 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5068998 | 58894 | BH00064AS | 0 0-2 7 | U238 | 0 97 | | 0 01 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| W209 | 2695387 | 57693 | BH50319AS | 0'-6 | U233234 | 1 03 | | 0.042 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3335572 | 57693 | BH50642AS | 0' 2 | U233234 | 0 86 | | 0.2 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695356 | 57693 | BH50319AS | 0'-6' | U235 | 0 0659 | | 0 016 | A | 0 022 | 0 068 | 0 114 | 0.16 |
| | 3335573 | 57693 | BH50642AS | 0' 2 | U235 | 0 042 | U | 0.2 | A | 0 022 | 0 068 | 0 114 | 016 |
| | 3335574 | 57693 | BH50642AS | 0' 2 | U238 | 0 85 | | 0 1 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| Exceeds the Background Mean plus on Standard Deviation but is less than Background Mean plus two Standard Deviations | | | | | | | | | | | | | |
| 115/196 | 3671208 | 59493 | BH50521AS | 6.9' 12 9' | U233234 | 2 6248 | | 0.0251 | Y | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2642375 | 58693 | BH50348AS | 0'-6' | U233234 | 2 | B | 0 015 | A | 0 779 | 1 711 | 2.643 | 3 441 |
| | 3671213 | 59593 | BH50553AS | 6' 12 | U233234 | 1 9101 | | 0 0306 | Y | 0 779 | 1 711 | 2.643 | 3 441 |
| | 2262645 | 50892 | BH50122AS | 6' 12 | U233234 | 1 8 | B | 0 02 | A | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2689777 | 58693 | BH50350AS | 19 5 25 5 | U233234 | 1 8 | B | 0 019 | A | 0 779 | 1 711 | 2.643 | 3 441 |
| | 3671057 | 61293 | BH50504AS | 0'-6 | U233234 | 1 7503 | | 0 0283 | Y | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2689776 | 58693 | BH50350AS | 19 5 25 5 | U235 | 0 11 | BJ | 0.011 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671081 | 61293 | BH50504AS | 0'-6 | U235 | 0 1051 | | 0 0194 | Y | 0 022 | 0 068 | 0 114 | 0 153 |

# Table 4-5 (Continued)

| IHSS/S't | Seque ce ID | Locatio | Sampl No. | Depth Interval | Constituent | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2262693 | 50692 | BH50087AS | 0'-6 | U235 | 0 096 | J | 0 016 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2262658 | 50792 | BH50105AS | 0' 10 | U235 | 0 091 | J | 0 006 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2253063 | 50592 | BH50064AS | 12 18 | U235 | 0 09 | J | 0 029 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671414 | 60993 | BH50588AS | 0'-6' | U235 | 0 088 | | 0 0216 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671238 | 59593 | BH50554AS | 14 4 16 4 | U235 | 0 0843 | | 0 0178 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671237 | 59593 | BH50553AS | 6' 12 | U235 | 0 084 | | 0 0188 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671076 | 59793 | BH50484AS | 0' 7 3 | U235 | 0 0832 | | 0 0204 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2689783 | 58693 | BH50405AS | 25 5 29 5 | U235 | 0 081 | BJ | 0 01 | A | 0 022 | 0.068 | 0 114 | 0 153 |
| | 5068985 | 58494 | BH00071AS | 6 0-9.5 | U235 | 0 08 | | 0 02 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2262637 | 50892 | BH50121AS | 0'-6 | U235 | 0 079 | J | 0 005 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2262623 | 50492 | BH50040AS | 18 24 | U235 | 0 078 | J | 0 011 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2262651 | 50792 | BH50104AS | 0'-6 | U235 | 0 078 | J | 0.005 | A | 0 022 | 0.068 | 0 114 | 0 153 |
| | 2262672 | 50992 | BH50138AS | 0'-6 | U235 | 0 078 | J | 0 005 | A | 0 022 | 0.068 | 0 114 | 0 153 |
| | 3671545 | 59593 | BH50540AS | 0' 2 | U235 | 0 0769 | | 0.021 | Y | 0.022 | 0 068 | 0 114 | 0 153 |
| | 2695014 | 58593 | BH50347AS | 0'-6 | U235 | 0 075495 | | 0 04943 | V | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2253021 | 50392 | BH50015AS | 18 24 | U235 | 0 074 | J | 0 015 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671554 | 61293 | BH50508AS | 0' 2 | U235 | 0 0732 | | 0.0207 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671418 | 63193 | BH50618AS | 12 20 | U235 | 0 0724 | | 0 0198 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2262630 | 50892 | BH50123AS | 8 16 | U235 | 0 072 | J | 0 012 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 5186002 | 59494 | BH00152AS | 0 0-5 9 | U235 | 0 07051 | | 0 0232 | V | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671070 | 59393 | BH50476AS | 0'-6 | U235 | 0 07 | | 0 0185 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671417 | 63193 | BH50617AS | 6' 12 | U235 | 0 0685 | | 0 022 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671077 | 59793 | BH50485AS | 5.3 11 3 | U235 | 0 0683 | | 0 0204 | Y | 0 022 | 0.068 | 0 114 | 0 153 |
| | 2689768 | 58693 | BH50349AS | 12' 19 5 | U238 | 1 45 | B | 0 021 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671262 | 59593 | BH50554AS | 14.4 16 4 | U238 | 1 448 | | 0 0178 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671572 | 61293 | BH50508AS | 0' 2 | U238 | 1 4435 | | 0 0207 | Y | 0 733 | 1 109 | 1.485 | 1.807 |
| | 2695036 | 58593 | BH50404AS | 12.5 18 1 | U238 | 1 437 | | 0 048526 | V | 0 733 | 1 109 | 1.485 | 1 807 |
| | 2253020 | 50392 | BH50015AS | 18 24 | U238 | 1 4 | B | 0 015 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2642401 | 58393 | BH50343AS | 0'-6 | U238 | 1 4 | B | 0 015 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5069008 | 57594 | BH00082AS | 6 0-12 0 | U238 | 1.39 | | 0 02 | Y | 0 733 | 1 109 | 1.485 | 1.807 |
| | 3671102 | 59793 | BH50486AS | 13 3 15 3 | U238 | 1.338 | | 0 0186 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671425 | 63193 | BH50617AS | 6' 12 | U238 | 1.3345 | | 0 022 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5069646 | 56694 | BH00095AS | 0 0-6 0 | U238 | 1.323 | | 0 0224 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671563 | 59593 | BH50540AS | 0' 2 | U238 | 1.3128 | | 0.021 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2252992 | 50592 | BH50066AS | 0' 32 | U238 | 1 3 | B | 0 015 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2262629 | 50892 | BH50123AS | 8' 16 | U238 | 1.3 | B | 0 012 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2262685 | 50992 | BH50140AS | 0' 16 | U238 | 1.3 | B | 0 024 | A | 0 733 | 1 109 | 1.485 | 1.807 |
| | 2695029 | 58593 | BH50403AS | 6' 12 5 | U238 | 1 262 | | 0 057886 | V | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3671573 | 59793 | BH50488AS | 0' 2 | U238 | 1.2495 | | 0 032 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671106 | 61293 | BH50505AS | 6' 10 6 | U238 | 1 2409 | | 0 0544 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 5069654 | 56694 | BH00096AS | 0 0-6 0 | U238 | 1 236 | | 0 0129 | V | 0 733 | 1 109 | 1 485 | 1 807 |
| | 5011955 | 56694 | BH00122AS | 43 0-150 0 | U238 | 1.234 | | 0 0272 | V | 0 733 | 1 109 | 1.485 | 1 807 |
| | 3671571 | 59293 | BH50444AS | 0' 2 | U238 | 1.2333 | | 0 0239 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671424 | 63193 | BH50616AS | 0'-6 | U238 | 1 2261 | | 0 0175 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5069638 | 56694 | BH00111AS | 0 0-35 0 | U238 | 1 214 | | 0 0159 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5186003 | 59494 | BH00152AS | 0 0-5 9 | U238 | 1 212 | | 0 0164 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5012728 | 57594 | BH00085AS | 18 0-23 0 | U238 | 1.209 | | 0 0143 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671259 | 59593 | BH50552AS | 0'-6 | U238 | 1 192 | | 0 0174 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3671090 | 59293 | BH50440AS | 6' 12 | U238 | 1 1855 | | 0.0287 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5069670 | 56694 | BH00112AS | 0 0-41 0 | U238 | 1 171 | | 0 0175 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671567 | 59493 | BH50524AS | 4 2 | U238 | 1 1581 | | 0 0221 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| 133 1 | 3671044 | 58893 | BH50458AS | 0'-6 | U233234 | 1 8486 | | 0 0207 | Y | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2525786 | 56293 | BH50210AS | 0' 2 | U235 | 0 08865 | | 0.044 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3335580 | 58893 | BH50646AS | 0' 2 | U235 | 0 076 | U | 0.2 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2439086 | 56193 | BH50177AS | 0'-6 | U235 | 0 073 | J | 0 021 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2525793 | 56293 | BH50206AS | 0'-6 | U235 | 0 06913 | | 0 048 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671093 | 58893 | BH50459AS | 6' 12 | U238 | 1 2577 | | 0 0207 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2550474 | 56493 | BH50219AS | 0'-6 | U238 | 1 2 | B | 0 017 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| [illegible]2 | 2522244 | 57293 | BH50252AS | 0'-6 | U233234 | 2 2 | B | 0 026 | A | 0 779 | 1 711 | 2 643 | 3 441 |
| | 2522272 | 57293 | BH50292AS | 26 30' | U233234 | 1 8 | B | 0 047 | A | 0 779 | 1 711 | 2 643 | 3 441 |
| | 2522313 | 57393 | BH50291AS | 22.1 26 1 | U235 | 0 11 | BJ | 0 014 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2625469 | 57193 | BH50246AS | 0' 2 | U235 | 0 09712 | | 0.096297 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2465685 | 57593 | BH50298AS | 0' 2 | U235 | 0 092 | J | 0 026 | A | 0 022 | 0.068 | 0 114 | 0 153 |
| | 2625490 | 57193 | BH50250AS | 7' 13 | U235 | 0 09156 | | 0 077064 | A | 0 022 | 0.068 | 0 114 | 0 153 |
| | 2467516 | 57093 | BH50241AS | 0' 2 | U235 | 0 0775 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 153 |

# Table 4-5 (Contnued)

| IHSS/S t | Seque ID | Locatio | Sampl No. | Depth Interval | Constitue t | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2522285 | 57393 | BH50257AS | 0'-6 6 | U235 | 0 077 | BJ | 0 018 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2522292 | 57393 | BH50258AS | 4 6 12 1 | U235 | 0 075 | BJ | 0 013 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2465713 | 57593 | BH50301AS | 12 14 | U235 | 0 072 | J | 0 017 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2467508 | 57093 | BH50242AS | 0'-6 | U235 | 0 0705 | | 0 015 | V | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2625470 | 57193 | BH50246AS | 0' 2 | U238 | 1 478 | | 0 150293 | A | 0 733 | 1 109 | 1.485 | 1 807 |
| | 2522298 | 57393 | BH50259AS | 10 2 18 1 | U238 | 1 4 | B | 0 044 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2550607 | 57493 | BH50261AS | 0' 2 | U238 | 1 4 | B | 0 014 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2465691 | 57593 | BH50299AS | 0'-6 | U238 | 1 4 | B | 0.015 | A | 0 733 | 1 109 | 1.485 | 1.807 |
| | 3671574 | 58793 | BH50645AS | 0' 2 | U238 | 1.3915 | | 0 025 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3670934 | 58793 | BH50406AS | 0'-6 1 | U238 | 1.3452 | | 0 0194 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2525815 | 56893 | BH50239AS | 8.3 14 3 | U238 | 1.324 | | 0 026 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2522263 | 57293 | BH50255AS | 20 26 | U238 | 1.3 | B | 0 013 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2522305 | 57393 | BH50260AS | 16 1 24 1 | U238 | 1.3 | B | 0 012 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2465705 | 57593 | BH50294AS | 6' 12 | U238 | 1.3 | B | 0.023 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3670935 | 58793 | BH50407AS | 6 1 12 | U238 | 1 2094 | | 0 0195 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2522312 | 57393 | BH50291AS | 22.1 26 1 | U238 | 1 2 | B | 0 023 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2550453 | 57493 | BH50265AS | 18 20 | U238 | 1 2 | B | 0 017 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2465698 | 57593 | BH50300AS | 6' 12 | U238 | 1 2 | B | 0 024 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2467559 | 57093 | BH50242AS | 0'-6 | U238 | 1 19 | | 0 015 | V | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3670937 | 58793 | BH50409AS | 18 24 | U238 | 1 1706 | | 0 0195 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2467558 | 57093 | BH50243AS | 6' 12 3 | U238 | 1 16 | | 0 | V | 0 733 | 1 109 | 1.485 | 1 807 |
| | 2467566 | 56993 | BH50199AS | 0'-4 | U238 | 1 11 | | 0 026 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2625491 | 57193 | BH50250AS | 7' 13 | U238 | 1 11 | | 0 087781 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| 133.3 | 3671055 | 61193 | BH50500AS | 0'-6 | U233234 | 1 8225 | | 0 0335 | Y | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2550497 | 56793 | BH50231AS | 0' 2 | U233234 | 1 8 | B | 0 033 | A | 0 779 | 1 711 | 2.643 | 3.441 |
| | 3671246 | 61393 | BH50576AS | 0' 10' | U235 | 0 1087 | | 0.0178 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671242 | 59693 | BH50557AS | 6' 12 | U235 | 0 1074 | | 0.0283 | Y | 0 022 | 0.068 | 0 114 | 0 153 |
| | 2439128 | 56593 | BH50221AS | 0' 2 | U235 | 0 082 | J | 0 053 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671079 | 61193 | BH50500AS | 0'-6 | U235 | 0 0809 | | 0 0206 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2439135 | 56593 | BH50222AS | 0'-6' | U235 | 0 08 | J | 0 011 | A | 0 022 | 0.068 | 0 114 | 0 153 |
| | 2439114 | 56693 | BH50226AS | 0' 2 | U235 | 0 069 | J | 0 011 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671263 | 59693 | BH50556AS | 0'-6 | U238 | 1 48435 | | 0 0246 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2550495 | 56793 | BH50231AS | 0' 2 | U238 | 1 4 | B | 0 06 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2550502 | 56793 | BH50232AS | 0'-6 | U238 | 1 4 | B | 0 016 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2439134 | 56593 | BH50222AS | 0'-6 | U238 | 1.3 | B | 0 019 | A | 0 733 | 1 109 | 1.485 | 1 807 |
| | 2439120 | 56693 | BH50227AS | 0'-6 | U238 | 1.3 | B | 0 022 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2439141 | 56593 | BH50223AS | 6' 12 | U238 | 1.2 | B | 0 12 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3671269 | 61393 | BH50570AS | 0'-6 | U238 | 1 1674 | | 0.0174 | Y | 0 733 | 1 109 | 1.485 | 1.807 |
| | 3671272 | 61493 | BH50583AS | 0' 8 5 | U238 | 1 13495 | | 0 0179 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| 133.4 | 3671051 | 58993 | BH50482AS | 6 4 12 | U233234 | 2 6331 | | 0 0389 | Y | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2695389 | 58093 | BH50315AS | 10 12 | U233234 | 2 46 | | 0 034 | A | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2653767 | 55693 | BH50100AS | 0'-6 | U233234 | 2 058 | | 0 12179 | A | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2653834 | 55793 | BH50306AS | 0' 2 | U233234 | 1 958 | | 0 099847 | A | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2525855 | 56093 | BH50271AS | 2 8 | U233234 | 1 735 | | 0.044 | A | 0 779 | 1 711 | 2.643 | 3.441 |
| | 2439051 | 55593 | BH50058AS | 6' 12 | U235 | 0 11 | J | 0 015 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671547 | 59093 | BH50648AS | 0' 2 | U235 | 0 0724 | | 0 0232 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2653776 | 55693 | BH50101AS | 6' 12 | U238 | 1 44 | | 0 049486 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2439071 | 55593 | BH50083AS | 24 26 | U238 | 1 4 | B | 0 018 | A | 0 733 | 1 109 | 1.485 | 1.807 |
| | 2525766 | 55993 | BH50187AS | 9 3 15 | U238 | 1.367 | | 0 04 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2522228 | 55593 | BH50057AS | 0'-6 | U238 | 1.3 | B | 0.012 | A | 0 733 | 1 109 | 1.485 | 1.807 |
| | 2439057 | 55593 | BH50059AS | 12 18 | U238 | 1.2 | B | 0 012 | A | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3671565 | 59093 | BH50648AS | 0' 2 | U238 | 1 1991 | | 0 0232 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 2653857 | 55693 | BH50113AS | 18' 24.5 | U238 | 1 169 | | 0 062282 | A | 0 733 | 1 109 | 1.485 | 1.807 |
| 133.5 | 2451942 | 55193 | BH50099AS | 6' 8 | U235 | 0 1 | BJ | 0 011 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2451956 | 55293 | BH50107AS | 6' 10' | U235 | 0 098 | BJ | 0 01 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2451949 | 55293 | BH50106AS | 0'-6 | U235 | 0 09 | J | 0 017 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2420013 | 55493 | BH50033AS | 6 12.4 | U235 | 0 0831 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2451934 | 55193 | BH50090AS | 0'-6 | U238 | 1 4 | B | 0 015 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2451941 | 55193 | BH50099AS | 6' 8 | U238 | 1 4 | B | 0 011 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2420082 | 55493 | BH50034AS | 12.4 19 3 | U238 | 1.34 | | 0 | V | 0 733 | 1 109 | 1 485 | 1 807 |
| 133 6 | 2451977 | 54893 | BH50017AS | 0'-6.5 | U235 | 0 09 | J | 0 016 | A | 0.022 | 0.068 | 0 114 | 0 153 |
| | 2451991 | 54993 | BH50035AS | 0'-6 | U235 | 0 083 | BJ | 0 01 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2451976 | 54893 | BH50017AS | 0'-6.5 | U238 | 1.3 | B | 0 007 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 2451983 | 54893 | BH50031AS | 4 4 12 | U238 | 1.3 | B | 0 031 | A | 0 733 | 1 109 | 1 485 | 1 807 |

# Table 4 5 (Contnued)

| IHSS/S't | Seque ID | Locatio | Sample N | Depth Interval | Constitue t | Result PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2451969 | 55093 | BH50131AS | 6' 13 2 | U238 | 1 2 | B | 0 02 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| Concret | 5112084 | 56194 | BH00043AS | 0 0-6 0 | U238 | 1 454 | | 0 0145 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| Pad | 4954863 | 56194 | BH00043AS | 0 0-6 0 | U238 | 1 2218 | | 0 0334 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| Magn t | 3671439 | 64493 | BH50632AS | 12 14 | U233234 | 2 2162 | | 0 0754 | Y | 0 779 | 1 711 | 2 643 | 3.441 |
| Anomaly | 3671449 | 64693 | BH50638AS | 0'-6 | U235 | 0 074 | | 0 0202 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| W of 133 | 3671471 | 64593 | BH50634AS | 0'-6 | U238 | 1.3318 | | 0 0184 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671468 | 64693 | BH50638AS | 0'-6 | U238 | 1.3286 | | 0 0202 | Y | 0 733 | 1 109 | 1.485 | 1.807 |
| | 3335616 | 64493 | BH50652AS | 0' 2 | U238 | 1.3 | | 0.2 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671475 | 64493 | BH50630AS | 0'-6 | U238 | 1.2046 | | 0 0208 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3335623 | 64593 | BH50653AS | 0' 2 | U238 | 1.2 | | 0 1 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671470 | 64693 | BH50640AS | 12 16 | U238 | 1 167 | | 0 0206 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 3671473 | 64593 | BH50636AS | 12 18 | U238 | 1 1653 | | 0 0219 | Y | 0 733 | 1 109 | 1.485 | 1 807 |
| | 3671474 | 64593 | BH50637AS | 18 20 | U238 | 1 1475 | | 0 0217 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3671476 | 64493 | BH50631AS | 6' 12 | U238 | 1 1303 | | 0 0271 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| | 3671469 | 64693 | BH50639AS | 6' 12 | U238 | 1 1098 | | 0 0199 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| S133 | 2695361 | 57793 | BH50322AS | 6 3 12 | U235 | 0 0814 | | 0 053 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 2695360 | 57993 | BH50316AS | 4 9 8 1 | U235 | 0 07345 | | 0 026 | A | 0 022 | 0 068 | 0 114 | 0 153 |
| | 3671562 | 57893 | BH50355AS | 0' 2 | U238 | 1 1521 | | 0 0303 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| TDEM 1 | 5362673 | 55194 | BH00028AS | 0 0-6 0 | U233234 | 1 845 | | 0 021 | Y | 0 779 | 1 711 | 2.643 | 3.441 |
| | 5362682 | 55194 | BH00029AS | 6 0-12 0 | U235 | 0 08957 | | 0 022 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 5362674 | 55194 | BH00028AS | 0 0-6 0 | U235 | 0 0855 | | 0 018 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| | 5362699 | 55294 | BH00031AS | 0 0-6 0 | U238 | 1 42 | | 0 0139 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5362707 | 55294 | BH00032AS | 6 0-12 0 | U238 | 1 404 | | 0 0232 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5362715 | 55294 | BH00033AS | 12.0-15.2 | U238 | 1 4 | | 0 0177 | Y | 0 733 | 1 109 | 1.485 | 1 807 |
| | 5362691 | 55194 | BH00030AS | 12 0-16 1 | U238 | 1.341 | | 0 0146 | Y | 0 733 | 1 109 | 1 485 | 1 807 |
| TDEM 2 | 5292588 | 56094 | BH00039AS | 12 0-18 0 | U238 | 1 427 | | 0.023 | Y | 0 733 | 1 109 | 1 485 | 1.807 |
| | 5112044 | 55894 | BH00036AS | 0 0-6 0 | U238 | 1 243 | | 0 0184 | V | 0 733 | 1 109 | 1 485 | 1.807 |
| [illegible]EM W133 | 5068983 | 58894 | BH00064AS | 0 0-2 7 | U235 | 0 07 | | 0 01 | Y | 0 022 | 0 068 | 0 114 | 0 153 |
| [illegible]9 | 2695403 | 57693 | BH50319AS | 0'-6 | U238 | 1 18 | | 0 033 | A | 0 733 | 1 109 | 1 485 | 1.807 |
| **Exceeds the Background Mean plus two Standard Deviations but is less than Background Mean plus three Standard Deviations** | | | | | | | | | | | | | |
| 115/196 | 2689769 | 58693 | BH50349AS | 12' 19 5 | U235 | 0 1491 | BJ | 0.012 | A | 0.022 | 0 068 | 0 114 | 0 16 |
| | 3671231 | 59493 | BH50520AS | 0'-6.3 | U235 | 0 1386 | | 0 0179 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671232 | 59493 | BH50521AS | 6 9' 12 9 | U235 | 0 13665 | | 0 0199 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2689782 | 58693 | BH50405AS | 25 5 29 5 | U238 | 1 8 | B | 0 016 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671261 | 59593 | BH50553AS | 6' 12 | U238 | 1 7904 | | 0 0188 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2262671 | 50992 | BH50138AS | 0'-6 | U238 | 1 7 | B | 0 005 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2642373 | 58693 | BH50348AS | 0'-6 | U238 | 1 7 | B | 0 015 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2689775 | 58693 | BH50350AS | 19 5 25 5 | U238 | 1 7 | B | 0 019 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671422 | 60993 | BH50588AS | 0'-6 | U238 | 1.6485 | | 0.0216 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2252999 | 50692 | BH50088AS | 6' 12 | U238 | 1 6 | B | 0 013 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2262657 | 50792 | BH50105AS | 0' 10 | U238 | 1 6 | B | 0 02 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2262636 | 50892 | BH50121AS | 0'-6 | U238 | 1 6 | B | 0 005 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2262643 | 50892 | BH50122AS | 6' 12 | U238 | 1 6 | B | 0 02 | A | 0 733 | 1 109 | 1.485 | 1 861 |
| | 2695015 | 58593 | BH50347AS | 0'-6 | U238 | 1.5995 | | 0 045962 | V | 0 733 | 1 109 | 1.485 | 1.861 |
| | 3671105 | 61293 | BH50504AS | 0'-6 | U238 | 1.527 | | 0 0283 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2252985 | 50692 | BH50089AS | 0' 14 | U238 | 1.5 | B | 0 025 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2642380 | 58693 | BH50417AS | 6' 12 | U238 | 1.5 | B | 0.061 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| 133 1 | 2695393 | 56393 | BH50211AS | 0' 2 | U233234 | 3.27 | | 0 022 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2525794 | 56293 | BH50206AS | 0'-6 | U238 | 1 621 | | 0.043 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2439078 | 56193 | BH50176AS | 0' 2 | U238 | 1.5 | B | 0 011 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2550467 | 56493 | BH50220AS | 0' 2 | U238 | 1.5 | B | 0.049 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| 133 2 | 2522251 | 57293 | BH50253AS | 6' 12 | U233234 | 2.9 | B | 0 038 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2522243 | 57293 | BH50252AS | 0'-6 | U235 | 0 15 | BJ | 0 015 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522271 | 57293 | BH50292AS | 26 30 | U235 | 0 13 | BJ | 0 018 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522257 | 57293 | BH50254AS | 12 18 | U235 | 0 12 | BJ | 0.01 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522235 | 57293 | BH50251AS | 0' 2 | U238 | 1 8 | B | 0 013 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2522256 | 57293 | BH50254AS | 12 18 | U238 | 1 8 | B | 0 01 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2522284 | 57393 | BH50257AS | 0'-6 6 | U238 | 1 6 | B | 0 011 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2624781 | 56893 | BH50236AS | 0' 2 | U238 | 1.531 | | 0 067023 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| 133.3 | 3671528 | 61193 | BH50649AS | 0' 2 | U233234 | 3.2214 | | 0 0286 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671546 | 61193 | BH50649AS | 0' 2 | U235 | 0 1417 | | 0 0227 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2439142 | 56593 | BH50223AS | 6' 12 | U235 | 0 12 | J | 0 059 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2439113 | 56693 | BH50226AS | 0' 2 | U238 | 1 6 | B | 0 031 | A | 0 733 | 1 109 | 1 485 | 1 861 |

# Table 4 5 (Contınued)

| IHSS/S t | Sequenc ID | Locatio | Sample No. | Depth Interval | Constituent | Result i PCI/G | Qualifier | Reporting Limit | Valid. | Mean + (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2550481 | 56793 | BH50233AS | 6' 12 | U238 | 1 6 | B | 0 045 | A | 0 733 | 1 109 | 1.485 | 1 861 |
| 133.4 | 3671075 | 58993 | BH50482AS | 6.4 12 | U235 | 0 1568 | | 0 0181 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2695366 | 58093 | BH50315AS | 10 12 | U235 | 0 151 | | 0 029 | A | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2653835 | 55793 | BH50306AS | 0' 2 | U235 | 0 1377 | | 0 053241 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2522229 | 55593 | BH50057AS | 0'-6 | U235 | 0 12 | BJ | 0 012 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2439050 | 55593 | BH50058AS | 6' 12 | U238 | 1 8 | B | 0 026 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2525773 | 55893 | BH50141AS | 0' 2 | U238 | 1 7 | | 0 047 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2653843 | 55793 | BH50307AS | 0'-6 | U238 | 1.546 | | 0 053116 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2695412 | 58093 | BH50313AS | 0' 2 | U238 | 1 5 | | 0 021 | A | 0 733 | 1 109 | 1.485 | 1 861 |
| 133 6 | 2451984 | 54893 | BH50031AS | 4.4 12 | U235 | 0 12 | J | 0 036 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2451990 | 54993 | BH50035AS | 0'-6 | U238 | 1.5 | B | 0 017 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2451997 | 54993 | BH50042AS | 6' 10 | U238 | 1.5 | B | 0 011 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| Magnet | 3335615 | 64493 | BH50652AS | 0' 2 | U235 | 0 14 | U | 0.2 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| Anomaly | 3335622 | 64593 | BH50653AS | 0' 2 | U235 | 0 14 | U | 0.2 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| W of 133 | 3671477 | 64493 | BH50632AS | 12 14 | U238 | 1 6662 | | 0 0497 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| S133 | 3335601 | 57793 | BH50329AS | 0' 2 | U235 | 0 14 | U | 0.2 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| TDEM 1 | 5362683 | 55194 | BH00029AS | 6 0-12 0 | U238 | 1 636 | | 0.0207 | Y | 0 733 | 1 109 | 1.485 | 1.861 |
| TDEM 2 | 4954862 | 55894 | BH00036AS | 0 0-6 0 | U238 | 1 4931 | | 0 0301 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| ***Exceeds the Background Mean plus three Standard Deviations*** | | | | | | | | | | | | | |
| 115/196 | 2642396 | 58493 | BH50346AS | 6' 12 | U233234 | 30 | B | 0 015 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2642410 | 58393 | BH50344AS | 6' 12.7' | U233234 | 9.3 | B | 0 047 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2642389 | 58493 | BH50345AS | 0'-6 | U233234 | 9 1 | B | 0 02 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671207 | 59493 | BH50520AS | 0'-6 3 | U233234 | 3 7629 | | 0 0343 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2642395 | 58493 | BH50346AS | 6' 12 | U235 | 2.3 | | 0 015 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2642409 | 58393 | BH50344AS | 6' 12.7' | U235 | 0.53 | | 0 02 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671082 | 61293 | BH50505AS | 6' 10 6 | U235 | 0.3395 | | 0.0431 | Y | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2642388 | 58493 | BH50345AS | 0'-6 | U235 | 0.32 | | 0 02 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2642394 | 58493 | BH50346AS | 6' 12 | U238 | 12 | B | 0.025 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2642408 | 58393 | BH50344AS | 6' 12.7 | U238 | 7.2 | B | 0 062 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2262692 | 50692 | BH50087AS | 0'-6' | U238 | 3 1 | B | 0 042 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671255 | 59493 | BH50520AS | 0'-6 3 | U238 | 2.9341 | | 0.0179 | Y | 0 733 | 1 109 | 1.485 | 1 861 |
| | 2642387 | 58493 | BH50345AS | 0'-6 | U238 | 2 9 | B | 0 037 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671423 | 61093 | BH50603AS | 6' 13 | U238 | 2 2229 | | 0 0306 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671256 | 59493 | BH50521AS | 6 9' 12 9' | U238 | 2 21265 | | 0 0199 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| 133 1 | 2695392 | 56393 | BH50212AS | 2'-6' | U233234 | 117 | | 0.36 | Z | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695390 | 56393 | BH50213AS | 6' 8 | U233234 | 13.2 | | 0 089 | A | 0 779 | 1 711 | 2 643 | 3.575 |
| | 5069676 | 57294 | BH00091AS | 0 0-4 0 | U233234 | 9 934 | | 0 0159 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695364 | 56393 | BH50212AS | 2-6' | U235 | 19.5 | | 0 6 | Z | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2695367 | 56393 | BH50213AS | 6' 8 | U235 | 1 7 | | 0 08 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5069677 | 57294 | BH00091AS | 0 0-4 0 | U235 | 0 6879 | | 0.0111 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2695365 | 56393 | BH50211AS | 0' 2 | U235 | 0 47 | | 0.028 | A | 0 022 | 0.068 | 0 114 | 0 16 |
| | 2695408 | 56393 | BH50212AS | 2'-6 | U238 | 1130 | | 0 49 | Z | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2695406 | 56393 | BH50213AS | 6' 8 | U238 | 120 | | 0 065 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 5069678 | 57294 | BH00091AS | 0 0-4 0 | U238 | 38.37 | | 0 00627 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2695409 | 56393 | BH50211AS | 0' 2 | U238 | 26 1 | | 0 023 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671092 | 58893 | BH50458AS | 0'-6 | U238 | 2 7069 | | 0 0207 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2525787 | 56293 | BH50210AS | 0' 2 | U238 | 2 101 | | 0 049 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| 133.2 | 2624795 | 56893 | BH50238AS | 4-8.3 | U233234 | 105 7 | | 0 275116 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2624787 | 56893 | BH50237AS | 2'-4 | U233234 | 33 03 | | 0 062518 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2467548 | 56993 | BH50200AS | 8 1 10 1 | U233234 | 15.3 | | 0 028 | V | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2624796 | 56893 | BH50238AS | 4 8 3 | U235 | 37 68 | | 0 227704 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2624788 | 56893 | BH50237AS | 2'-4 | U235 | 1 015 | | 0 067032 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2467518 | 56993 | BH50200AS | 8 1 10 1 | U235 | 0 916 | | 0 | V | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2465692 | 57593 | BH50299AS | 0'-6 | U235 | 0 18 | J | 0 026 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2550615 | 57493 | BH50262AS | 0'-6 | U235 | 0 17 | J | 0 023 | A | 0 022 | 0 068 | 0 114 | 0.16 |
| | 2624797 | 56893 | BH50238AS | 4 8.3 | U238 | 1160 | | 0 194178 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2467562 | 56993 | BH50200AS | 8 1 10 1 | U238 | 29 7 | | 0 028 | V | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2624789 | 56893 | BH50237AS | 2'-4 | U238 | 19 41 | | 0 057163 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2467561 | 56993 | BH50202AS | 8 1 14 | U238 | 2.97 | | 0 023 | V | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2522242 | 57293 | BH50252AS | 0'-6 | U238 | 2.5 | B | 0 026 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2522249 | 57293 | BH50253AS | 6' 12 | U238 | 2.3 | B | 0 02 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2522291 | 57393 | BH50258AS | 4 6' 12 1 | U238 | 2 1 | B | 0 021 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2522270 | 57293 | BH50292AS | 26' 30 | U238 | 2 | B | 0 03 | A | 0 733 | 1 109 | 1 485 | 1.861 |

## Table 4-5 (Contınued)

| IHSS/S t | Sequence ID | Location | Sample No. | Depth Interval | Constıtuent | Result ın PCI/G | Qualifier | Reportıng Limit | Valid. | Mean + (X STD DEV) of background Mean | X = 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2625477 | 57193 | BH50247AS | 0' 5 5 | U238 | 1 923 | | 0 04808 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| 133.3 | 2550489 | 56793 | BH50233AS | 6' 12 | U235 | 0 26 | J | 0 027 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671564 | 61193 | BH50649AS | 0' 2 | U238 | 9.344 | | 0 0227 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671103 | 61193 | BH50500AS | 0'-6 | U238 | 4 6052 | | 0 0206 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2439127 | 56593 | BH50221AS | 0' 2 | U238 | 2 4 | B | 0 06 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| 133.4 | 5411953 | 55694 | BH00042AS | 6 0-10 6 | U233234 | 241 | | 4 73 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695394 | 58093 | BH50314AS | 0' 8 | U233234 | 126 | | 0 77 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2695395 | 58093 | BH50314AS | 0' 8 | U233234 | 126 | | 0 18 | Z | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2525876 | 55993 | BH50151AS | 0'-6 | U233234 | 113.3 | | 0 069 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 2525757 | 55993 | BH50161AS | 4 9 3 | U233234 | 84 93 | | 0.238 | A | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5411952 | 55694 | BH00041AS | 0 0-6 0 | U233234 | 58 4 | | 1 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 3671532 | 58993 | BH50647AS | 0' 2 | U233234 | 25 7624 | | 0 0444 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 3671049 | 58993 | BH50480AS | 0'-6 4 | U233234 | 12.9864 | | 0 0476 | Y | 0 779 | 1 711 | 2 643 | 3.575 |
| | 2525877 | 55993 | BH50151AS | 0'-6 | U235 | 17 | | 0 066 | A | 0 022 | 0 068 | 0 114 | 0.16 |
| | 5411957 | 55694 | BH00042AS | 6 0-10 6 | U235 | 16 1 | | 4.5 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2695369 | 58093 | BH50314AS | 0' 8 | U235 | 10 | | 0.23 | Z | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2695363 | 58093 | BH50314AS | 0'-8 | U235 | 6 64 | | 0.37 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5411956 | 55694 | BH00041AS | 0 0-6 0 | U235 | 5 84 | | 0 685 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 2525758 | 55993 | BH50161AS | 4 9 3 | U235 | 5 624 | | 0.207 | A | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671550 | 58993 | BH50647AS | 0' 2 | U235 | 1.5278 | | 0 0352 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 3671073 | 58993 | BH50480AS | 0'-6 4 | U235 | 0 65315 | | 0 0249 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5411961 | 55694 | BH00042AS | 6 0-10 6 | U238 | 848 | | 3 63 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2695411 | 58093 | BH50314AS | 0' 8 | U238 | 519 | | 0 088 | Z | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2695410 | 58093 | BH50314AS | 0' 8 | U238 | 485 | | 0 63 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2525759 | 55993 | BH50161AS | 4-9 3 | U238 | 244.2 | | 0 187 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5411960 | 55694 | BH00041AS | 0 0-6 0 | U238 | 216 | | 0 749 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2525878 | 55993 | BH50151AS | 0'-6 | U238 | 183 | | 0.059 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 3671568 | 58993 | BH50647AS | 0' 2 | U238 | 97.2346 | | 0 0352 | Y | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671097 | 58993 | BH50480AS | 0'-6.4 | U238 | 47 1546 | | 0 0249 | Y | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2695405 | 58093 | BH50315AS | 10' 12 | U238 | 8.5 | | 0 03 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 3671099 | 58993 | BH50482AS | 6.4 12 | U238 | 8.27275 | | 0 0265 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2653836 | 55793 | BH50306AS | 0' 2 | U238 | 3.338 | | 0 091294 | A | 0 733 | 1 109 | 1.485 | 1.861 |
| | 2525871 | 55993 | BH50162AS | 0' 2 | U238 | 2.522 | | 0 043 | A | 0 733 | 1 109 | 1 485 | 1 861 |
| | 2525857 | 56093 | BH50271AS | 2' 8 | U238 | 2 414 | | 0 044 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2653769 | 55693 | BH50100AS | 0'-6 | U238 | 2 195 | | 0 145224 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| 133.5 | 2451948 | 55293 | BH50106AS | 0'-6 | U238 | 2.3 | B | 0 007 | A | 0 733 | 1 109 | 1 485 | 1.861 |
| | 2420074 | 55493 | BH50033AS | 6' 12.4 | U238 | 2 07 | | 0 018 | V | 0 733 | 1 109 | 1 485 | 1 861 |
| M. A W 133 | 3671458 | 64493 | BH50632AS | 12 14 | U235 | 0.3204 | | 0.0394 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| TDEM 1 | 5362675 | 55194 | BH00028AS | 0 0-6 0 | U238 | 1.951 | | 0 0235 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| TDEM 2 | 5394391 | 55994 | BH00034AS | 0 0-6 0 | U233234 | 288.2869 | | 5 764328 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5292570 | 56094 | BH00037AS | 0 0-6 0 | U233234 | 21 24 | | 0 0126 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5292594 | 56094 | BH00040AS | 18 0-22 0 | U233234 | 15.31 | | 0 048 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5292578 | 56094 | BH00038AS | 6 0-12 0 | U233234 | 11 94 | | 0.0411 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5394393 | 55994 | BH00035AS | 6 0-11.2 | U233234 | 10 1869 | | 0 162069 | Y | 0 779 | 1 711 | 2.643 | 3.575 |
| | 5394395 | 55994 | BH00034AS | 0 0-6 0 | U235 | 36 11686 | | 3 601073 | Y | 0 022 | 0.068 | 0 114 | 0 16 |
| | 5394397 | 55994 | BH00035AS | 6 0-11.2 | U235 | 0 849322 | | 0 138323 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5292571 | 56094 | BH00037AS | 0 0-6 0 | U235 | 0 7023 | | 0 0113 | Y | 0 022 | 0.068 | 0 114 | 0 16 |
| | 5292595 | 56094 | BH00040AS | 18 0-22 0 | U235 | 0.6218 | | 0.0306 | Y | 0.022 | 0 068 | 0 114 | 0 16 |
| | 5292579 | 56094 | BH00038AS | 6 0-12 0 | U235 | 0.3899 | | 0 0338 | Y | 0 022 | 0 068 | 0 114 | 0 16 |
| | 5394399 | 55994 | BH00034AS | 0 0-6 0 | U238 | 933 0405 | | 3.936487 | Y | 0 733 | 1 109 | 1.485 | 1 861 |
| | 5394401 | 55994 | BH00035AS | 6 0-11 2 | U238 | 22 84702 | | 0 138323 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5292572 | 56094 | BH00037AS | 0 0-6 0 | U238 | 16.62 | | 0 0137 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5292596 | 56094 | BH00040AS | 18 0-22 0 | U238 | 15 75 | | 0 0416 | Y | 0 733 | 1 109 | 1 485 | 1 861 |
| | 5292580 | 56094 | BH00038AS | 6 0-12 0 | U238 | 10 93 | | 0 0455 | Y | 0 733 | 1 109 | 1 485 | 1.861 |

These data ar graphically displayed on Figures 4-5 and 5b.

# Table 4 6
## Summary of Organic COCs in Subsurface Soil

| IHSS | S quen ID | Location | Sample No | Depth Interval | Constituent | Result in ug/kg | Qualifier | Reporting Limit | Valid. |
|---|---|---|---|---|---|---|---|---|---|
| **Detected at concentration less than Reporting Limit** | | | | | | | | | |
| 115/196 | 2744797 | 58493 | BH50345AS | 0'-6 | B nzo( )anthracene | 330 | J | 330 | A |
| | 2086490 | 50992 | BH50139AS | 6 12 | B nzo( )anthracene | 240 | J | 330 | A |
| | 2632850 | 58593 | BH50403AS | 6 12.5 | Benzo(a)anthracene | 180 | J | 330 | A |
| | 2744293 | 58393 | BH50343AS | 0' 6 | B nzo( )anthrace | 170 | J | 330 | A |
| | 2035976 | 50492 | BH50037AS | 0'-6 | B nzo( )anthracene | 130 | J | 330 | A |
| | 2086132 | 50692 | BH50087AS | 0' 6 | B nzo( )anthracene | 44 | J | 330 | A |
| | 2744803 | 58493 | BH50345AS | 0' 6 | B nzo( )pyren | 280 | J | 330 | A |
| | 2086496 | 50992 | BH50139AS | 6 12 | B nzo( )pyrene | 250 | BJ | 330 | A |
| | 5045251 | 57594 | BH00087AS | 84 9 90 4 | B nzo( )pyr ne | 130 | J | 330 | A |
| | 5045343 | 57594 | BH00086AS | 24 0-60 0 | B nzo(a)pyrene | 110 | J | 330 | A |
| | 2744299 | 58393 | BH50343AS | 0'-6 | Benzo(a)pyrene | 100 | J | 330 | A |
| | 2632856 | 58593 | BH50403AS | 6 12 5 | B nzo( )pyrene | 98 | J | 330 | A |
| | 5160749 | 59894 | BH00164AS | 19 9 31 9 | B nzo( )pyre | 58 | J | 330 | A |
| | 2086138 | 50692 | BH50087AS | 0' 6 | B nzo(a)pyrene | 47 | J | 330 | A |
| | 2086494 | 50992 | BH50139AS | 6 12 | B nzo(b)fluoranth ne | 260 | BJ | 330 | A |
| | 2744297 | 58393 | BH50343AS | 0' 6 | Benzo(b)fluoranthene | 250 | J | 330 | A |
| | 2632854 | 58593 | BH50403AS | 6 12.5 | Benzo(b)fluoranthene | 220 | J | 330 | A |
| | 2035980 | 50492 | BH50037AS | 0' 6 | B nzo(b)fluoranthene | 100 | J | 330 | A |
| | 2086136 | 50692 | BH50087AS | 0' 6 | Benzo(b)fluoranthene | 81 | J | 330 | A |
| **Exceeds Reporting Limit but is less than ten times the Reporting Limit** | | | | | | | | | |
| 115/196 | 2711716 | 59493 | BH50520AS | 0'-6 3 | Benzo( )anthracene | 2400 | | 330 | V |
| | 2712569 | 59493 | BH50520AS | 0'-6 3 | Benzo(a)anthracene | 2200 | D | 330 | Z |
| | 2712398 | 59493 | BH50521AS | 6 9 12.9 | B nzo(a)anthracene | 1700 | D | 330 | Z |
| | 2744971 | 58693 | BH50349AS | 12 19 5 | B nzo(a)anthracene | 1500 | | 330 | V |
| | 2745063 | 58693 | BH50349AS | 12 19 5 | Benzo(a)anthracene | 1400 | D | 330 | Z |
| | 2711300 | 59493 | BH50521AS | 6 9 12 9 | Benzo(a)anthracene | 1310 | | 330 | V |
| | 2086398 | 50992 | BH50138AS | 0' 6 | Benzo(a)anthracene | 1300 | | 330 | V |
| | 2086582 | 50992 | BH50140AS | 0' 16 | Benzo(a)anthracene | 950 | | 330 | V |
| | 2086766 | 51092 | BH50154AS | 0' 12' | Benzo(a)anthracene | 860 | | 330 | V |
| | 2086674 | 51092 | BH50153AS | 0' 6 | Benzo(a)anthracene | 850 | | 330 | V |
| | 2744527 | 58393 | BH50344AS | 6 12.7' | B nzo(a)anthracene | 510 | | 330 | V |
| | 2745322 | 58693 | BH50348AS | 0' 6 | Benzo(a)anthracene | 500 | | 330 | V |
| | 2711482 | 59493 | BH50522AS | 12 9' 17 8 | B nzo(a)pyrene | 3200 | E | 330 | Z |
| | 2711722 | 59493 | BH50520AS | 0'-6 3 | Benzo(a)pyrene | 2200 | | 330 | V |
| | 2712575 | 59493 | BH50520AS | 0'-6 3 | Benzo(a)pyrene | 2200 | D | 330 | Z |
| | 2712404 | 59493 | BH50521AS | 6 9 12.9 | B nzo( )pyren | 1700 | D | 330 | Z |
| | 2744977 | 58693 | BH50349AS | 12 19 5 | Benzo( )pyrene | 1400 | | 330 | V |
| | 2086404 | 50992 | BH50138AS | 0' 6 | B nzo( )pyrene | 1300 | B | 330 | V |
| | 2711306 | 59493 | BH50521AS | 6 9 12 9 | B nzo( )pyrene | 1220 | | 330 | V |
| | 2745069 | 58693 | BH50349AS | 12 19 5 | B nzo(a)pyrene | 1200 | D | 330 | Z |
| | 2086588 | 50992 | BH50140AS | 0' 16 | Benzo(a)pyrene | 920 | B | 330 | V |
| | 2086680 | 51092 | BH50153AS | 0' 6 | Benzo(a)pyrene | 840 | | 330 | V |
| | 2086772 | 51092 | BH50154AS | 0' 12 | B nzo( )pyrene | 830 | | 330 | V |
| | 5141798 | 56694 | BH00122AS | 43 0-150 0 | B nzo( )pyrene | 480 | J | 330 | A |
| | 5140749 | 57594 | BH00121AS | 24 0-105 0 | B nzo( )pyr ne | 470 | J | 330 | A |
| | 2744533 | 58393 | BH50344AS | 6 12.7' | B nzo( )pyre | 460 | | 330 | V |
| | 2745328 | 58693 | BH50348AS | 0' 6 | B nzo( )pyrene | 390 | | 330 | V |
| | 5141710 | 56694 | BH00113AS | 43 0-150 0 | B nzo( )pyrene | 350 | J | 330 | A |
| | 2711720 | 59493 | BH50520AS | 0'-6 3 | B nzo(b)fluoranth | 2700 | | 330 | V |
| | 2712573 | 59493 | BH50520AS | 0'-6 3 | B nzo(b)fluoranth ne | 2500 | D | 330 | Z |

# Table 4 6 (Contınued)

| IHSS | Sequence ID | Location | Sample N | Depth Interval | Constituent | Result in ug/kg | Qualifier | Reporting Limit | Valid. |
|---|---|---|---|---|---|---|---|---|---|
| | 2712402 | 59493 | BH50521AS | 6 9 12 9 | B nzo(b)fluoranthene | 1900 | D | 330 | Z |
| | 2711304 | 59493 | BH50521AS | 6 9 12 9 | B nzo(b)fluoranthene | 1610 | | 330 | V |
| | 2086402 | 50992 | BH50138AS | 0' 6 | B nzo(b)fluoranthene | 1500 | B | 330 | V |
| | 2744975 | 58693 | BH50349AS | 12 19 5 | B nzo(b)fluoranthene | 1500 | | 330 | V |
| | 2745067 | 58693 | BH50349AS | 12 19 5 | Benzo(b)fluoranth ne | 1500 | D | 330 | Z |
| | 2086586 | 50992 | BH50140AS | 0' 16 | B nzo(b)fluoranthene | 1000 | B | 330 | V |
| | 2086770 | 51092 | BH50154AS | 0' 12' | B nzo(b)fluoranth ne | 940 | | 330 | V |
| | 2086678 | 51092 | BH50153AS | 0' 6 | Benzo(b)fluoranthene | 910 | | 330 | V |
| | 2744531 | 58393 | BH50344AS | 6 12 7 | Benzo(b)fluoranthene | 660 | | 330 | V |
| | 2745326 | 58693 | BH50348AS | 0' 6 | B nzo(b)fluoranth ne | 520 | | 330 | V |
| | 2744801 | 58493 | BH50345AS | 0' 6 | Benzo(b)fluoranthene | 370 | | 330 | V |
| | 2604357 | 58693 | BH50417AS | 6 12 | PCB 1254 | 960 | X | 160 | V |
| | 2087591 | 50992 | BH50140AS | 0' 16 | PCB 1254 | 870 | | 160 | V |
| | 2702888 | 61093 | BH50603AS | 6 13 | PCB 1254 | 860 | | 160 | V |
| | 2704838 | 59493 | BH50520AS | 0'-6 3 | PCB 1254 | 630 | | 160 | V |
| | 2087535 | 50992 | BH50138AS | 0'-6 | PCB 1254 | 600 | | 160 | V |
| | 2087619 | 51092 | BH50153AS | 0' 6 | PCB 1254 | 500 | | 160 | V |
| | 2604133 | 58393 | BH50344AS | 6 12.7 | PCB 1254 | 440 | | 160 | V |
| | 2087563 | 50992 | BH50139AS | 6 12 | PCB 1254 | 320 | | 160 | V |
| | 2087647 | 51092 | BH50154AS | 0' 12 | PCB 1254 | 240 | | 160 | V |
| | 2604189 | 58493 | BH50345AS | 0'-6 | PCB 1254 | 210 | | 160 | V |
| **Exceeds ten times the Reporting Limit but is less than on hundred time the Reporting Limit** | | | | | | | | | |
| 115/196 | 2711476 | 59493 | BH50522AS | 12 9' 17 8 | B nzo( )anthracene | 4300 | E | 330 | Z |
| | 2712481 | 59493 | BH50522AS | 12 9 17 8 | B nzo( )anthracene | 3700 | D | 330 | V |
| | 2712487 | 59493 | BH50522AS | 12 9' 17 8 | B nzo( )pyrene | 3800 | D | 330 | V |
| | 2712485 | 59493 | BH50522AS | 12 9' 17 8 | Benzo(b)fluoranth ne | 4500 | D | 330 | V |
| | 2711480 | 59493 | BH50522AS | 12 9' 17 8 | B nzo(b)fluoranth ne | 4100 | E | 330 | Z |
| **Exceeds one hundred times the Reporting Limit** | | | | | | | | | |
| 115/196 | 2745413 | 58693 | BH50417AS | 6 12 | Benzo( )anthracene | 48000 | | 330 | JA |
| | 2745491 | 58693 | BH50417AS | 6 12 | Benzo(a)anthracene | 40000 | D | 330 | Z |
| | 2745419 | 58693 | BH50417AS | 6 12 | B nzo( )pyrene | 43000 | | 330 | JA |
| | 2745497 | 58693 | BH50417AS | 6 12 | B nzo(a)pyre | 35000 | DJ | 330 | Z |
| | 2745417 | 58693 | BH50417AS | 6 12 | Benzo(b)fluoranth ne | 48000 | | 330 | JA |
| | 2745495 | 58693 | BH50417AS | 6 12 | B nzo(b)fluoranthene | 40000 | D | 330 | Z |

**These data are graphically displayed on Figures 4-6a and 6b**

# Table 4-7
## Summary of Metal COCs Exceeding Background Mean in Subsurface Soil

| IHSS | Sequence ID | Location | Sample No | Sample Date | TGC | Constituent | Result ( ug/l | Qualifier | Reporting Limit | Valid. | Mean | Mean (X STD DEV) of background X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exceeds the Background Mean bu is less than Background Mean plus one Standard Deviation | | | | | | | | | | | | | | |
| 115/196 | 5196762 | 58094 | GW50102AS | 12/21/94 | DISSOLVED | ALUMINUM | 319 | U | 200 | JA | 113.66 | 708.46 | 1303.26 | 1898.06 |
| | 5196791 | 58094 | GW50103AS | 12/21/94 | DISSOLVED | ALUMINUM | 264 | U | 200 | JA | 113.66 | 708.46 | 1303.26 | 1898.06 |
| | 2815138 | 59493 | GW01166WC | 8/11/93 | DISSOLVED | ALUMINUM | 200 | U | 200 | JA | 113.66 | 708.46 | 1303.26 | 1898.06 |
| | 5368668 | 59894 | GW02201GA | 3/7/95 | DISSOLVED | BARIUM | 113 | B | 200 | Y | 84 | 117 1 | 150.2 | 183.3 |
| | 4927315 | 59593 | GW01619GA | 10/24/94 | DISSOLVED | BARIUM | 108 | B | 9 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 3526634 | 59593 | GW01481WC | 11/10/93 | DISSOLVED | BARIUM | 106 | B | 23 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5170624 | 60293 | GW50143AS | 1/22/95 | DISSOLVED | BARIUM | 85.4 | B | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5473754 | 57594 | GW02352GA | 4/11/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | Y | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170567 | 57894 | GW50141AS | 1/22/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170596 | 57894 | GW50161AS | 1/22/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5196765 | 58094 | GW50102AS | 12/21/94 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5196794 | 58094 | GW50103AS | 12/21/94 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5196823 | 58594 | GW50104AS | 12/21/94 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 4674393 | 59493 | GW01247GA | 8/18/94 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | V | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201436 | 59493 | GW50113AS | 1/4/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201519 | 59493 | GW5011 AS | 1/4/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170310 | 59593 | GW50131AS | 1/11/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170741 | 59594 | GW02058GA | 1/25/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5368752 | 59694 | GW02202GA | 3/7/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | Y | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170625 | 60293 | GW50143AS | 1/22/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | V | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170654 | 60293 | GW50144AS | 1/22/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170857 | 60893 | GW50157AS | 1/26/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170799 | 61093 | GW50151AS | 1/25/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170828 | 61093 | GW50154AS | 1/25/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170397 | 61293 | GW50126AS | 1/7/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201867 | 63193 | GW50130AS | 1/10/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | V | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201664 | 63893 | GW50120AS | 1/5/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201635 | 63993 | GW50119AS | 1/5/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201606 | 64093 | GW50118AS | 1/5/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5170634 | 60293 | GW50143AS | 1/22/95 | DISSOLVED | MANGANESE | 88.4 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 4927517 | 59593 | GW01619GA | 10/24/94 | DISSOLVED | MANGANESE | 81.9 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5170663 | 60293 | GW50144AS | 1/22/95 | DISSOLVED | MANGANESE | 70.9 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5196831 | 58594 | GW50104AS | 12/21/94 | DISSOLVED | MANGANESE | 46.2 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5368678 | 59894 | GW02201GA | 3/7/95 | DISSOLVED | MANGANESE | 44.3 | | 15 | Y | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5368826 | 71494 | GW02241GA | 3/14/95 | DISSOLVED | VANADIUM | 12.9 | B | 50 | Y | 12.37 | 22.34 | 32.31 | 42.28 |
| 133 | 2657525 | 58793 | GW01017WC | 6/18/93 | DISSOLVED | ALUMINUM | 200 | U | 200 | JA | 113.66 | 708.46 | 1303.26 | 1898.06 |
| | 2815167 | 58793 | GW01168WC | 8/12/93 | DISSOLVED | ALUMINUM | 200 | U | 200 | JA | 113.66 | 708.46 | 1303.26 | 1898.06 |
| | 5389507 | 58793 | GW02189GA | 3/7/95 | DISSOLVED | BARIUM | 112 | B | 0.6 | Y | 84 | 117 1 | 150.2 | 183.3 |
| | 5389478 | 63093 | GW02188GA | 3/7/95 | DISSOLVED | BARIUM | 107 | B | 0.6 | Y | 84 | 117 1 | 150.2 | 183.3 |
| | 5196881 | 55394 | GW50106AS | 12/22/94 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5196852 | 56594 | GW50105AS | 12/22/94 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | JA | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201693 | 58793 | GW50123AS | 1/6/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | V | 2.22 | 2.91 | 3.6 | 4.29 |
| | 5201548 | 63793 | GW50115AS | 1/4/95 | DISSOLVED | BERYLLIUM | 2.5 | U | 5 | V | 2.22 | 2.91 | 3.6 | 4.29 |
| | 4940442 | 58793 | GW01615GA | 10/20/94 | DISSOLVED | MANGANESE | 34.8 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| 142 | 2393064 | 51193 | GW00466WC | 3/20/93 | DISSOLVED | ALUMINUM | 200 | U | 200 | JA | 113.66 | 708.46 | 1303.26 | 1898.06 |
| | 5281511 | 50092 | GW02174GA | 2/21/95 | DISSOLVED | BARIUM | 105 | B | 0.4 | V | 84 | 117 1 | 150.2 | 183.3 |
| Exceeds the Background Mean plus one Standard Deviation but is less than Background Mean plus two Standard Deviations | | | | | | | | | | | | | | |
| 115/196 | 779519 | 59593 | GW01248GA | 8/18/94 | DISSOLVED | BARIUM | 150 | B | 14 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 2763936 | 59593 | GW01025WC | 6/24/93 | DISSOLVED | BARIUM | 139 | | 17 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5389275 | 59393 | GW02175GA | 3/6/95 | DISSOLVED | BARIUM | 133 | B | 0.6 | Y | 84 | 117 1 | 150.2 | 183.3 |
| | 3342469 | 59593 | GW01167WC | 8/13/93 | DISSOLVED | BARIUM | 118 | | 16 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5196802 | 58094 | GW50103AS | 12/21/94 | DISSOLVED | MANGANESE | 163 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| 133 | 940432 | 58793 | GW01615GA | 10/20/94 | DISSOLVED | BARIUM | 145 | B | 1 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4763950 | 58793 | GW01245GA | 9/13/94 | DISSOLVED | BARIUM | 140 | B | 1 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5201692 | 58793 | GW50123AS | 1/6/95 | DISSOLVED | BARIUM | 139 | B | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5201547 | 63793 | GW50115AS | 1/4/95 | DISSOLVED | BARIUM | 131 | B | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4763960 | 58793 | GW01245GA | 9/13/94 | DISSOLVED | MANGANESE | 148 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| Exceeds the Background Mean plus two Standard Deviations bu is less than Background Mean plus three Standard Deviations | | | | | | | | | | | | | | |
| 115/196 | 5170396 | 61293 | GW50126AS | 1/7/95 | DISSOLVED | BARIUM | 179 | B | 200 | JA | 84 | 117 1 | 150.2 | 183.3 |
| | 5368809 | 1 94 | GW02241GA | 3/14/95 | DISSOLVED | BARIUM | 162 | B | 200 | Y | 84 | 117 1 | 150.2 | 183.3 |
| | 5170309 | 59593 | GW50131AS | 1/11/95 | DISSOLVED | BARIUM | 156 | B | 200 | V | 84 | 117.1 | 150.2 | 183.3 |
| | 5201866 | 63 93 | GW50130AS | 1/ 0/95 | DISSOLVED | BARIUM | 155 | B | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5368751 | 59694 | GW02202GA | 3/7/95 | DISSOLVED | BARIUM | 151 | B | 200 | Y | 84 | 117 1 | 150.2 | 183.3 |
| | 3526954 | 59593 | GW01481WC | 11/10/93 | DISSOLVED | MANGANESE | 286 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5368761 | 59694 | GW02202GA | 3/7/95 | DISSOLVED | MANGANESE | 234 | | 15 | Y | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5196773 | 58094 | GW50102AS | 12/21/94 | DISSOLVED | MANGANESE | 212 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| 133 | 2657506 | 58793 | GW01017WC | 6/18/93 | DISSOLVED | BARIUM | 156 | B | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 2815170 | 58793 | GW01168WC | 8/12/93 | DISSOLVED | BARIUM | 155 | B | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 3526635 | 58793 | GW01482WC | 11/10/93 | DISSOLVED | BARIUM | 154 | B | 23 | V | 84 | 117 1 | 150.2 | 183.3 |
| 142 | 2614508 | 50092 | GW00670WC | 4/27/93 | DISSOLVED | BARIUM | 156 | | 17 | V | 84 | 117 1 | 150.2 | 183.3 |
| Exceeds the Background Mean plus three Standard Deviations | | | | | | | | | | | | | | |

## Table 4-7 (Continued)

| IHSS | Sequence ID | Location | Sample No | Sample Date | TGC | Constituent | Result ug/l | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X=1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 115/196 | 5170306 | 59593 | GW50131AS | 1/11/95 | DISSOLVED | ALUMINUM | 900 | | 200 | V | 113.66 | 708.46 | 1303.26 | 1898.0 |
| | 3526633 | 59493 | GW01480WC | 11/9/93 | DISSOLVED | BARIUM | 647 | | 23 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4940461 | 59493 | GW01618GA | 10/20/94 | DISSOLVED | BARIUM | 457 | | 1 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 28151 1 | 59493 | GW01166WC | 8/11/93 | DISSOLVED | BARIUM | 7 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 2763878 | 59493 | GW01024WC | 6/24/93 | DISSOLVED | BARIUM | 396 | | 17 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4674392 | 59493 | GW01247GA | 8/18/94 | DISSOLVED | BARIUM | 393 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5201663 | 63893 | GW50120AS | 1/5/95 | DISSOLVED | BARIUM | 348 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5329028 | 59493 | GW02176GA | 3/9/95 | DISSOLVED | BARIUM | 344 | | 12 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5201518 | 59493 | GW50114AS | 1/4/95 | DISSOLVED | BARIUM | 340 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5201435 | 59493 | GW50113AS | 1/4/95 | DISSOLVED | BARIUM | 326 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5201634 | 63993 | GW50119AS | 1/5/95 | DISSOLVED | BARIUM | 315 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5201605 | 64093 | GW50118AS | 1/5/95 | DISSOLVED | BARIUM | 238 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5207158 | 56994 | GW02089GA | 2/3/95 | DISSOLVED | BARIUM | 216 | | 12 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5170740 | 59594 | GW02058GA | 1/25/95 | DISSOLVED | BARIUM | 213 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 3526953 | 59493 | GW01480WC | 11/9/93 | DISSOLVED | MANGANESE | 10500 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 2763890 | 59493 | GW01024WC | 6/24/93 | DISSOLVED | MANGANESE | 4240 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 2815151 | 59493 | GW01166WC | 8/11/93 | DISSOLVED | MANGANESE | 3650 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5201643 | 63993 | GW50119AS | 1/5/95 | DISSOLVED | MANGANESE | 3530 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 4940471 | 59493 | GW01618GA | 10/20/94 | DISSOLVED | MANGANESE | 3480 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5201672 | 63893 | GW50120AS | 1/5/95 | DISSOLVED | MANGANESE | 3170 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5201527 | 59493 | GW50114AS | 1/4/95 | DISSOLVED | MANGANESE | 3130 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5201444 | 59493 | GW50113AS | 1/4/95 | DISSOLVED | MANGANESE | 2960 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 4674402 | 59493 | GW01247GA | 8/18/94 | DISSOLVED | MANGANESE | 2920 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5329290 | 59493 | GW02176GA | 3/9/95 | DISSOLVED | MANGANESE | 2510 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5368819 | 71494 | GW02241GA | 3/14/95 | DISSOLVED | MANGANESE | 2090 | | 15 | Y | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5201614 | 64093 | GW50118AS | 1/5/95 | DISSOLVED | MANGANESE | 1300 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5170750 | 59594 | GW02058GA | 1/25/95 | DISSOLVED | MANGANESE | 1160 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5170866 | 60893 | GW50157AS | 1/26/95 | DISSOLVED | MANGANESE | 1100 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 3342481 | 59593 | GW01167WC | 8/13/93 | DISSOLVED | MANGANESE | 761 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 2763948 | 59593 | GW01025WC | 6/24/93 | DISSOLVED | MANGANESE | 680 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 4779662 | 59593 | GW01248GA | 8/18/94 | DISSOLVED | MANGANESE | 608 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5170319 | 59593 | GW50131AS | 1/11/95 | DISSOLVED | MANGANESE | 514 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5170406 | 61293 | GW50126AS | 1/7/95 | DISSOLVED | MANGANESE | 356 | | 15 | JA | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5389285 | 59393 | GW02175GA | 3/6/95 | DISSOLVED | MANGANESE | 21 | | 0.6 | Y | 32.66 | 20.09 | 207.52 | 294.95 |
| 133 | 5196889 | 55394 | GW50106AS | 12/22/94 | DISSOLVED | MANGANESE | 843 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5201556 | 63793 | GW50115AS | 1/4/95 | DISSOLVED | MANGANESE | 765 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 2657494 | 58793 | GW01017WC | 6/18/93 | DISSOLVED | MANGANESE | 515 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 2815180 | 58793 | GW01168WC | 8/12/93 | DISSOLVED | MANGANESE | 480 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 3526955 | 58793 | GW01482WC | 11/10/93 | DISSOLVED | MANGANESE | 477 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| 142 | 2393067 | 51193 | GW00466WC | 3/20/93 | DISSOLVED | BARIUM | 257 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4927310 | 51193 | GW01612GA | 10/24/94 | DISSOLVED | BARIUM | 244 | | 9 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4927313 | 51193 | GW01613GA | 10/24/94 | DISSOLVED | BARIUM | 243 | | 9 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4779516 | 51193 | GW01242GA | 8/18/94 | DISSOLVED | BARIUM | 239 | | 14 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 5252975 | 51193 | GW02110GA | 2/8/95 | DISSOLVED | BARIUM | 239 | | 12 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 3449296 | 51193 | GW01477WC | 11/12/93 | DISSOLVED | BARIUM | 235.5 | | 200 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 2614566 | 51193 | GW00672WC | 4/26/93 | DISSOLVED | BARIUM | 234.5 | | 17 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 4779517 | 51193 | GW01243GA | 8/19/94 | DISSOLVED | BARIUM | 226 | | 14 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 3342245 | 51193 | GW01163WC | 8/16/93 | DISSOLVED | BARIUM | 219.5 | | 16 | V | 84 | 117 1 | 150.2 | 183.3 |
| | 3449306 | 51193 | GW01477WC | 11/12/93 | DISSOLVED | MANGANESE | 3005 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 2393077 | 51193 | GW00466WC | 3/20/93 | DISSOLVED | MANGANESE | 2930 | | 15 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 4927512 | 51193 | GW01612GA | 10/24/94 | DISSOLVED | MANGANESE | 2910 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 2614578 | 51193 | GW00672WC | 4/26/93 | DISSOLVED | MANGANESE | 2890 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 4927515 | 51193 | GW01613GA | 10/24/94 | DISSOLVED | MANGANESE | 2850 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 779660 | 51193 | GW01243GA | 8/19/94 | DISSOLVED | MANGANESE | 2810 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 4779659 | 51193 | GW01242GA | 8/18/94 | DISSOLVED | MANGANESE | 2780 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 3342257 | 51193 | GW01163WC | 8/16/93 | DISSOLVED | MANGANESE | 2775 | | 2 | V | 32.66 | 120.09 | 207.52 | 294.95 |
| | 5253105 | 51193 | GW02110GA | 2/8/95 | DISSOLVED | MANGANESE | 2470 | | 1 | V | 32.66 | 120.09 | 207.52 | 294.95 |

These d ta are gr phic lly displayed on Figures 4-7 and 7b

## Table 4-8
## Summary of Radionuclide COCs Exceeding Background Mean in Groundwater

| IHSS | Sequence ID | Location | Sampl No. | Sample Date | TGC | Constituent | Resul in PCI/L | Qualifier | Reporting Limit | Valid. | Mean | X 1 | X 2 | X 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Mean (X STD DEV) of background | | | |
| Exceeds the Background Mean b is less han background Mean plus one Standard Deviation | | | | | | | | | | | | | | |
| 115/196 | 5186130 | 61093 | GW50154AS | 1/25/95 | DISSOLVED | U233234 | 16.06 | | 0.204 | Y | 6.914 | 32.354 | 57 794 | 83.23 |
| | 5179279 | 59793 | GW50133AS | 1/15/95 | DISSOLVED | U233234 | 14 14 | | 0 124 | V | 6.914 | 32.354 | 57 794 | 83.23 |
| | 5186114 | 61093 | GW50151AS | 1/25/95 | DISSOLVED | U233234 | 14.05 | | 0.328 | Y | 6 914 | 32.354 | 57 794 | 83.23 |
| | 2891018 | 61093 | GW50012AS | 7/13/93 | DISSOLVED | U233234 | 11.5 | B | 0.042 | A | 6.914 | 32.354 | 57 794 | 83.23 |
| | 5186131 | 61093 | GW50154AS | 1/25/95 | DISSOLVED | U235 | 0.6157 | | 0.223 | Y | 0 195 | 0.835 | 1.475 | 2.11 |
| | 5179280 | 59793 | GW50133AS | 1/15/95 | DISSOLVED | U235 | 0.5459 | | 0.124 | V | 0 195 | 0.835 | 1.475 | 2.11 |
| | 2891046 | 63193 | GW50013AS | 7/12/93 | DISSOLVED | U235 | 0.53 | J | 0.075 | A | 0 195 | 0.835 | 1.475 | 2.11 |
| | 3348328 | 59593 | GW01167WC | 8/13/93 | DISSOLVED | U235 | 0.37 | J | 0.22 | A | 0 195 | 0.835 | 1.475 | 2.11 |
| | 4780715 | 59593 | GW01248GA | 8/18/94 | DISSOLVED | U235 | 0.351491 | | 0.219133 | V | 0 195 | 0.835 | 1.475 | 2.11 |
| | 2891017 | 61093 | GW50012AS | 7/13/93 | DISSOLVED | U235 | 0.34 | J | 0.071 | A | 0 195 | 0.835 | 1.475 | 2.11 |
| | 5126081 | 58094 | GW50102AS | 12/21/94 | DISSOLVED | U235 | 0.3006 | | 0.18 | V | 0 195 | 0.835 | 1.475 | 2.11 |
| | 5422179 | 56994 | GW02089GA | 2/3/95 | DISSOLVED | U235 | 0.269029 | | 0.137205 | Y | 0 195 | 0.835 | 1.475 | 2.11 |
| | 5014072 | 59593 | GW01619GA | 10/24/94 | DISSOLVED | U235 | 0.231264 | Y | 0.184722 | A | 0 195 | 0.835 | 1.475 | 2.11 |
| | 2891291 | 59593 | GW01025WC | 6/24/93 | DISSOLVED | U235 | 0.2 | BJ | 0.059 | A | 0 195 | 0.835 | 1.475 | 2.11 |
| | 5456180 | 59393 | GW02175GA | 3/6/95 | DISSOLVED | U235 | 0 195893 | | 0 121974 | Y | 0 195 | 0.835 | 1.475 | 2.11 |
| | 5179281 | 59793 | GW50133AS | 1/15/95 | DISSOLVED | U238 | 10.61 | | 0.124 | V | 4.832 | 22.502 | 40.172 | 57.84 |
| | 2891016 | 61093 | GW50012AS | 7/13/93 | DISSOLVED | U238 | 8.8 | | 0.071 | A | 4.832 | 22.502 | 40.172 | 57.84 |
| | 2891045 | 63193 | GW50013AS | 7/12/93 | DISSOLVED | U238 | 5.4 | | 0 14 | A | 4.832 | 22.502 | 40.172 | 57.84 |
| 133.2 | 3348392 | 58793 | GW01168WC | 8/12/93 | DISSOLVED | AM241 | 0.018 | | 0.005 | V | 0.011 | 0.021 | 0.031 | 0.04 |
| | 5178939 | 56594 | GW50105AS | 12/22/94 | DISSOLVED | U235 | 0.2769 | | 0.163 | Y | 0 195 | 0.835 | 1.475 | 2.11 |
| 142 10 | 2595924 | 50092 | GW00465WC | 3/21/93 | DISSOLVED | U235 | 0.39 | | 0.115 | A | 0.195 | 0.835 | 1.475 | 2.11 |
| | 3548656 | 50092 | GW01 76WC | 11/9/93 | DISSOLVED | U235 | 0.347146 | | 0.13696 | Y | 0.195 | 0.835 | 1.475 | 2.11 |
| | 5014067 | 51193 | GW01613GA | 10/24/94 | DISSOLVED | U235 | 0.312575 | Y | 0.159788 | A | 0 195 | 0.835 | 1.475 | 2.11 |
| | 80708 | 5 193 | GW01242GA | 8/18/94 | DISSOLVED | U235 | 0.271692 | | 0.289707 | V | 0 195 | 0.835 | 1.475 | 2.11 |
| | 2626193 | 50092 | GW00670WC | 4/27/93 | DISSOLVED | U235 | 0.25 | J | 0.14 | A | 0.195 | 0.835 | 1.475 | 2.11 |
| | 5424574 | 50092 | GW02174GA | 2/21/95 | DISSOLVED | U235 | 0.21 | U | 0.46 | Y | 0.195 | 0.835 | 1.475 | 2.11 |
| Exceeds the Background Mean plus one Standard Devi tion bu is less than background Mean plus two Standard Deviations | | | | | | | | | | | | | | |
| 115/196 | 5186115 | 61093 | GW50151AS | 1/25/95 | DISSOLVED | U235 | 1.076 | | 0.283 | Y | 0 195 | 0.835 | 1.475 | 2.11 |
| | 5186132 | 61093 | GW50154AS | 1/25/95 | DISSOLVED | U238 | 28.18 | | 0.223 | Y | 4.832 | 22.502 | 40.172 | 57.84 |
| | 5186116 | 61093 | GW50151AS | 1/25/95 | DISSOLVED | U238 | 26.97 | | 0.255 | Y | 4.832 | 22.502 | 40.172 | 57.84 |
| 142.10 | 3548575 | 50092 | GW01476WC | 11/9/93 | DISSOLVED | RA226 | 0.386215 | | 0.2391 | V | 0.258 | 0.368 | 0.478 | 0.58 |
| Exceeds the Background Mean plus tw Standard Deviations but is less than background Mean plus three Standard Deviations | | | | | | | | | | | | | | |
| 115/196 | 2889861 | 59593 | GW01025WC | 6/24/93 | DISSOLVED | RA226 | 0.56 | B | 0.07 | A | 0.258 | 0.368 | 0.478 | 0.58 |
| 133.2 | 2889862 | 58793 | GW01017WC | 6/18/93 | DISSOLVED | RA226 | 0.55 | B | 0.08 | A | 0.258 | 0.368 | 0.478 | 0.58 |
| 142.10 | 2889793 | 50092 | GW00670WC | 4/27/93 | DISSOLVED | RA226 | 0.55 | | 0.2 | A | 0.258 | 0.368 | 0.478 | 0.58 |
| Exceeds the Background Mean plus thre Standard Deviations | | | | | | | | | | | | | | |
| 115/196 | 3548576 | 59493 | GW01480WC | 11/9/93 | DISSOLVED | RA226 | 1.02928 | | 0.16835 | V | 0.258 | 0.368 | 0.478 | 0.58 |
| | 5387052 | 71494 | GW02241GA | 3/14/95 | DISSOLVED | RA226 | 0.8898 | | 0.0337 | Y | 0.258 | 0.368 | 0.478 | 0.58 |

These d ta are g phically displayed on Figures 4-8a and 8b.

**Table 4-9**

**Summary of Radionuclide COCs Exceeding Background Mean in Surface Water**

| IHSS/Site | Sequence ID | Locatio | Sample N | Sample Date | TGC | Constituen | Result in PCI/L | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exceeds the Background Mean b less than Background Mean plus one Standard Deviation** | | | | | | | | | | | | | | |
| 142 | 2596118 | SW50193 | SW50208JE | 3 .4/93 | TOTAL | U233234 | 0.5 | | 0.02 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2596158 | SW50293 | SW50210JE | 3/24/93 | TOTAL | U238 | 73 | | 0.282 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| | 2596156 | SW50193 | SW50208JE | /24/93 | TOTAL | U238 | 0.43 | | 0.039 | A | 0.3642 | 0.7962 | 1 2282 | 1 6602 |
| SID | 25961 | SW507 | SW50203JE | /24/93 | DISSOLVED | U23 234 | | | 0.033 | | 92 | 5 3 | .34 | 13.55 |
| | 2802121 | SW027 | SW50222JE | 5 17/93 | DISSOLVED | U233234 | 2.0995 | | 0.287212 | A | 0.92 | 5.13 | 9.34 | 13.55 |
| | 2802105 | SW507 | SW5022 JE | 5/ 3 | ISSOLVED | U23 234 | .85 | | 0.3 4962 | A | 92 | 5 13 | 9.34 | 13.55 |
| | 2802107 | SW507 | SW50221JE | 5/17/93 | DISSOLVED | U238 | 3 049 | | 0.168335 | A | 0.708 | 3 949 | 7 19 | 10.431 |
| | 2802123 | SW027 | SW50222JE | 5/1 /93 | ISSOLVED | U238 | 4495 | | 0.256975 | | 0.708 | 949 | 7 19 | 10.431 |
| | 2596168 | SW507 | SW50217JE | 3/29/93 | DISSOLVED | U238 | 0.88 | | 0.026 | A | 0.708 | 3 949 | 7 19 | 10.431 |
| | 2596163 | SW027 | SW50220JE | /29/93 | DISSOLVED | U238 | 0.8 | | 0.032 | A | 708 | 3 949 | 7 1 | 10.431 |
| | 5020062 | SW027 | SW00545GS | 10/17/94 | TOTAL | AM241 | 0.011 | | 0.01 | V | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 897475 | SW500 | SW50000AS | 0/5/92 | TOTAL | AM24 | 009538 | | 0 | | 0039 | 0 9 | 0. 99 | 0.0279 |
| | 2802094 | SW507 | SW50221JE | 5/1 /93 | TOTAL | AM241 | 0.007072 | J | 0.010152 | A | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 2802109 | SW027 | SW50222JE | 5 /93 | TOTAL | AM24 | 006386 | J | 0.010758 | A | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 1897478 | SW500 | SW50000AS | 0/5/92 | TOTAL | U233234 | 0.7748 | | 0.156 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2596126 | SW027 | SW50218JE | /29/93 | TOTAL | U233234 | 0.77 | | 0.228 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 897480 | SW500 | SW50000AS | 0/5/92 | TOTAL | U238 | 0.6967 | | 0.22 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| Woman Ck. | 23 602 | SW026 | SW502 3WC | 4/92 | DISSOLVED | U233234 | 2.103 | | 0 | A | 0.92 | 5.13 | 9.34 | 13.55 |
| | 2616182 | SW026 | SW50201JE | 3/24/93 | DISSOLVED | U233234 | 1.8 | | 0.1458 | A | 0.92 | 5 13 | 9.34 | 13.55 |
| | 25 | SW50 | SW50205JE | 3/24/93 | ISSOLVED | U23 234 | .537 | | 0.264 | A | 92 | 5 1 | 9.34 | 13.55 |
| | 2616200 | SW029 | SW50204JE | /24/93 | DISSOLVED | U233234 | .5 | | 0.14767 | A | 0.92 | 5.13 | 9.34 | 13.55 |
| | 26 6227 | SW03 | SW50207JE | /24/93 | ISSOLVED | U23 234 | .3 | | 0. 4242 | A | 0.92 | 5. 3 | 9.34 | 13.55 |
| | 2549161 | SW040 | SW50211JE | 3/24/93 | DISSOLVED | U233234 | 1 0705 | | 0.226 | A | 0.92 | 5.13 | 9.34 | 13.55 |
| | 23 6 6 | SW029 | SW50216WC | 4/92 | DISSOLVED | U233234 | 00875 | | | A | 0.92 | 5 3 | 9.34 | 13.55 |
| | 2616245 | SW107 | SW50214JE | 3/24/93 | DISSOLVED | U233234 | 0.99 | | 0.20696 | A | 0.92 | 5 13 | 9.34 | 13.55 |
| | 232 604 | SW026 | SW50213WC | 4/92 | DISSOLVED | U238 | 1.304 | | 0 | A | 0.708 | 3.949 | 7 19 | 10.431 |
| | 2616184 | SW026 | SW50201JE | 3/24/93 | DISSOLVED | U238 | 1 1 | | 0.1335 | JA | 0.708 | 3 949 | 7 19 | 10.431 |
| | 2616229 | SW03 | SW50207JE | 3/24/93 | DISSOLVED | U238 | 1 1 | | 0.15164 | JA | 0.708 | 3 949 | 7 19 | 10.431 |
| | 2102016 | SW033 | SW50221WC | 11/4/92 | DISSOLVED | U238 | 0.9946 | | 0.131 | A | 0.708 | 3.949 | 7 19 | 10.431 |
| | 2101998 | SW501 | SW50219WC | 4/92 | DISSOLVED | U238 | 0.8965 | | 0.16 | A | 0.708 | 3.949 | 19 | 10.431 |
| | 2616202 | SW029 | SW50204JE | 3/24/93 | DISSOLVED | U238 | 0.76 | | 0.12081 | JA | 0.708 | 3.949 | 7 19 | 10.431 |
| | 2549 35 | SW501 | SW50205JE | 3/24/93 | DISSOLVED | U238 | 0. 52 | | 0.274 | A | 0.708 | 3 949 | 7 19 | 10.431 |
| | 2616167 | SW029 | SW50204JE | 3/24/93 | TOTAL | AM241 | 0.0094 | | 0.00629 | A | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 23 1606 | SW029 | SW50216WC | 1/4/92 | TOTAL | AM241 | 0.009255 | J | 0 | Z | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 2103896 | SW034 | SW50220WC | 11/4/92 | TOTAL | AM241 | 0.005712 | J | 0 | A | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 26 6248 | SW107 | SW50214JE | 3/24/93 | TOTAL | AM241 | 0.0053 | U | 0.00642 | | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 2616257 | SW041 | SW50215JE | 3/24/93 | TOTAL | AM241 | 0.0045 | U | 0.00654 | A | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 2024634 | SW040 | SW50223WC | 1/4/92 | TOTAL | AM241 | 0.0041 7 | J | 0 | A | 0.0039 | 0.01 9 | 0.0199 | 0.0279 |
| | 2103906 | SW033 | SW50221WC | 11/4/92 | TOTAL | U233234 | 0.9116 | | 0.141 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 26 6236 | SW03 | SW50207JE | 3/24/93 | TOTAL | U233234 | 0.88 | | 0.18413 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2675623 | SW55193 | SW70040JE | 5/24/93 | TOTAL | U233234 | 0.69 | B | 0.15 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 26161 5 | SW029 | SW50204JE | 3/24/93 | TOTAL | U238 | 0.77 | | 0.17916 | JA | 0.3642 | 0.7962 | .2282 | 1.6602 |
| | 2549141 | SW506 | SW50209JE | 3/24/93 | TOTAL | U238 | 0.6992 | | 0.335 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| | 03908 | SW033 | SW50221WC | 4/92 | TOTAL | U238 | 0.583 | J | 0.215 | | 0.3642 | 7962 | 1.2282 | 1.6602 |
| **Exceeds the Background Mean plus one Standard Deviation but is less than Background Mean plus two Standard Deviations** | | | | | | | | | | | | | | |
| SID | 5020064 | SW027 | SW00545GS | 10/17/94 | TOTAL | U233234 | 2 | | 0.3 | V | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2596164 | SW027 | SW50218JE | 3/29/93 | TOTAL | U238 | 1 026 | | 0.114 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| Woman Ck. | 232159 | SW026 | SW50213WC | 4/92 | TOTAL | U233234 | 1 429 | | 0.197 | A | 0.4862 | 1.0362 | 1.5862 | 2.1362 |
| | 2103892 | SW501 | SW50219WC | 11/4/92 | TOTAL | U233234 | 1.346 | | 0.149 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2549 25 | SW50 | SW50205JE | 3/24/93 | TOTAL | U233234 | .244 | | 0.216 | A | 0.4862 | 0362 | .5862 | 2.1362 |
| | 2549139 | SW506 | SW50209JE | 3/24/93 | TOTAL | U233234 | 1 133 | | 0.335 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2321607 | SW029 | SW50216WC | 4/92 | TOTAL | U233234 | 1 0664 | | 0 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2549153 | SW040 | SW50211JE | 3/24/93 | TOTAL | U233234 | 1 066 | | 0.207 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 2616193 | SW026 | SW50201JE | 3/24/93 | TOTAL | U238 | 1.2 | | 0.19753 | JA | 0.3642 | 0.7962 | 1.2282 | 1 6602 |
| | 2103894 | SW501 | SW50219WC | 11/4/92 | TOTAL | U238 | 1 131 | | 0.189 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| | 2616238 | SW033 | SW50207JE | 3/24/93 | TOTAL | U238 | 1 1 | | 0.16477 | JA | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| | 2321609 | SW029 | SW50216WC | 11/4/92 | TOTAL | U238 | 0.94385 | | 0.114 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| | 2549127 | SW501 | SW50205JE | 3/24/93 | TOTAL | U238 | 9062 | | 0.245 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| | 2549155 | SW040 | SW50211JE | 3/24/93 | TOTAL | U238 | 0.8653 | | 0.174 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| **Exceeds the Background Mean plus tw Standard Deviations but is less than Background Mean plus three Standard Deviations** | | | | | | | | | | | | | | |
| SID | 2596155 | SW507 | SW50203JE | 3/24/93 | DISSOLVED | U238 | .5 | | 0.032 | A | 0.708 | 3 949 | 7 19 | 10.431 |
| | 2802113 | SW027 | SW50222JE | 5/17/93 | TOTAL | U233234 | 1 9755 | | 0.256933 | A | 0.4862 | 1 0362 | 1.5862 | 2.1362 |
| | 5020066 | SW027 | SW00545GS | 0/17/94 | TOTAL | U238 | .5 | | 0.2 | V | 0.3642 | 7962 | 1.2282 | 1.6602 |
| Woman Ck. | 26 6191 | SW026 | SW50201JE | 3/24/93 | TOTAL | U233234 | 1 9 | | 0.22804 | A | 0.4862 | 1.0362 | 1.5862 | 2.1362 |
| | 26 6173 | SW029 | SW50204JE | 3/24/93 | TOTAL | U233234 | | | 0.15809 | A | 0.4862 | 1.0362 | 1.5862 | 2.1362 |
| | 2321595 | SW026 | SW50213WC | 11/4/92 | TOTAL | U238 | 1 437 | | 0.171 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| | 267562 | SW551 3 | SW70040JE | 5/24/93 | TOTAL | U238 | 1.3 | B | 0.22 | A | 0.3642 | 0.7962 | 1.2282 | 1.6602 |
| **Exceeds the Background Mean plus three Standard Deviations** | | | | | | | | | | | | | | |
| 1 2 | 2596228 | SW50293 | SW50210JE | 3/24/93 | TOTAL | AM241 | 0.38 | | 0.202 | A | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| SID | 2596234 | SW027 | SW50218JE | 3/29/93 | TOTAL | AM241 | 0.18 | | 0.228 | A | 0.0039 | 0.0119 | 0.0199 | 0.0279 |
| | 2596224 | SW507 | SW50203JE | 3/24/93 | TOTAL | AM24 | 075 | | 0.079 | | 0.0039 | 9 | 0 99 | 0.0279 |
| | 2802098 | SW507 | SW50221JE | 5/17/93 | TOTAL | U233234 | 4.675 | | 0.196649 | | 0.4862 | 0362 | 1.5862 | 2.1362 |
| | 2596 | SW507 | SW50203JE | 3/24/93 | TOTAL | 233234 | | | 0.056 | | 4862 | 0362 | 1.5862 | 2.1362 |
| | 2596154 | SW507 | SW50203JE | 3/24/93 | TOTAL | U238 | 7 | | 0.052 | A | 0.3642 | 0.7962 | 1.2282 | 1 6602 |
| | 2802100 | SW507 | SW50221JE | 5/ /93 | TOTAL | U238 | 5.206 | | 0. 96649 | V | 0.3642 | 0.7962 | 1.2282 | 1 6602 |
| | 2802115 | SW027 | SW50222JE | 5/1 /93 | TOTAL | U238 | 2.144 | | 0.365052 | V | 0.3642 | 0.7962 | 1.2282 | 1.6602 |

**Thes ata re graphically displayed on Figure 4-10.**

## Table 4-10
## Summary of Metal COCs Exceedıng Background Mean ın Stream Sedıments

| IHSS | Sequence ID | Locatio | Sample No. | C nstituent | Result in mg/kg | Qualifier | Reporting Limit | Valid. | Mean (X STD DEV) of background: Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exceeds the Background Mean but is less than Background Mean plus one Standard Deviation** | | | | | | | | | | | | |
| Wmn. Ck. | 1883115 | SED501 | SD50004WC | COPPER | 14 5 | | 5 | JA | 10 24 | 18 01 | 25 78 | 33 55 |
| Wmn. Ck. | 1883255 | SED506 | SD50008WC | COPPER | 13 4 | | 5 | JA | 10 24 | 18 01 | 25 78 | 33 55 |
| **Exceeds the Background Mean plus one Standard Deviation but is less than Background Mean plus two Standard Deviations** | | | | | | | | | | | | |
| SID | 1883072 | SED025 | SD50002WC | ZINC | 164 | E | 4 | JA | 53 86 | 136 94 | 220 02 | 303 1 |
| **Ex eeds the Background Mean plus two Standard Deviations but is less than Background Mean plus three Standard Deviations** | | | | | | | | | | | | |
| SID | 1883059 | SED025 | SD50002WC | COPPER | 27 1 | | 5 | V | 10 24 | 18 01 | 25 78 | 33 55 |
| **Ex eeds the Backgr und Mean plus three Standard Deviations** | | | | | | | | | | | | |
| SID | 1883171 | SED507 | SD50005WC | COPPER | 135 5 | | 5 | JA | 10 24 | 18 01 | 25 78 | 33 55 |
| SID | 1883176 | SED507 | SD50005WC | MERCURY | 3 05 | | 0 1 | JA | 0 09 | 0 15 | 0 21 | 0 27 |
| SID | 1883184 | SED507 | SD50005WC | ZINC | 709 | E | 4 | JA | 53 86 | 136 94 | 220 02 | 303 1 |

These d ta ar graphically displayed Figures 4-11 and 11b.

## Table 4-11
## Summary of Radionuclide COCs Exceeding Background Mean in Stream Sediments

| IHSS | Seq ence ID | Location | Sample No. | Constituent | Resul i PCI/G | Q alifier | Reporting Limit | Valid. | Mean (X STD DEV) of background Mean | X 1 | X=2 | X=3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exceeds th Background Mean bu is less than Background Mean plus one Standard Deviation | | | | | | | | | | | | |
| SID | 2341693 | SED025 | SD50002WC | AM241 | 0.29 | | 0.021 | A | 0 173 | 0.657 | 1 141 | 1.625 |
| | 2341717 | SED507 | SD50005WC | AM241 | 0.25 | | 0.007 | A | 0 173 | 0.657 | 1 141 | 1.625 |
| | 2341697 | SED025 | SD50002WC | PU239240 | 1.6 | | 0.007 | V | 0.537 | 2.147 | 3 757 | 5.367 |
| | 2341721 | SED507 | SD50005WC | PU239240 | 0 915 | | 0.006 | V | 0.537 | 2.147 | 3 757 | 5.367 |

These d ta are gr phically displayed on Figures 4-12a and 12b

# 5 0 CHEMICAL FATE AND TRANSPORT

This chapter discusses the chemical fate and transport modeling performed in support of the HHRA for OU 5 The objectives of this modeling were to simulate the transport of COCs from OU 5 to potential exposure points for human receptors under present and anticipated future site conditions and to provide information needed for the evaluation of potential remedial alternatives at OU 5

## 5 1 POTENTIAL ROUTES OF MIGRATION

Figures 5 1 through 5 ` illustrate potential routes of migration for groundwater surface water and air respectively Understanding these routes of migration is not only fundamental to chemical fate and transport modeling but also is the basis for assessing of potential exposure routes to human receptors for the risk assessment. The potential routes of migration in each environmental medium are discussed briefly below The human health exposure assessment is presented in detail in TM12 (DOE 1995b) and is discussed in Section 6 4

The hydrogeologic profile of the OU 5 groundwater flow and contaminant transport system, including saturated and unsaturated zones illustrates the potential migration of contaminants from a source (e g the landfill area) This potential migration route runs through the unsaturated and saturated zones of the UHSU to the creek or to seeps along the hillsides adjacent to Woman Creek (Figure 5 1) The profile also depicts the potential contamination of groundwater and soils with VOCs Once the contaminants reach the seeps they evaporate or migrate downslope in surface flow or near surface groundwater flow in the unconsolidated material to the creek. They may then be transported via surface water processes Surface water processes are discussed in Sections 2 3 and 3 4 VOC contaminants in the unsaturated zone could be mobilized by desorption, dissolution, or vaporization from contaminated soil Once mobilized contaminants would migrate to the surface and escape into the atmosphere by volatilization The contaminants could also migrate into groundwater

The hydrogeologic profile (Figure 5 1) does not include all of the contaminant sources–such as metals and particulate radioactive contamination in soils–that may exist at the site However under the hydrogeochemical conditions of OU 5 metals and radionuclides are not expected to be very mobile Therefore migration of metals and radionuclides through the groundwater pathway is considered to be negligible and is not illustrated in Figure 5 1 Nevertheless the selected transport model has the capability to incorporate radioactive decay and sorption of radionuclides

The profile of surface water pathways (Figure 5 2) illustrates the numerous potential mechanisms for contaminant migration Storm water runoff may transport contaminated soils to surface waters through erosion with subsequent transport to downstream receptors Surface waters and suspended sediments may be impacted from the discharge of contaminated groundwater via seeps and springs Once groundwater borne contaminants reach surface waters the potential migration routes are identical to those described above for contaminated storm water

The air emissions and dispersion models selected to assess concentrations of air contaminants at sensitive receptors estimated the exposure point concentrations for the exposure pathways associated with air transport (Figure 5 3) VOCs may be transported through the vadose zone from underlying soils or groundwater and may intrude into a hypothetical building located within OU 5 (volatilization into indoor air and subsequent inhalation by a future onsite office worker) Chemicals in surface soils may be transported via fugitive particulate emissions from OU 5 to onsite exposure points (inhalation of particulates by the future onsite outdoor worker and ecological researcher) Fugitive dust emissions from OU 5 may also result in the deposition of chemicals in airborne particulates on surface soils and plants

## 5 2 CONTAMINANT MOBILITY AND BEHAVIOR

Potential mechanisms for the release of contaminants from OU 5 sources are described in Section 5 1 above and are discussed in additional detail in Exposure Assessment TM for the HHRA TM12 (DOE 1995b) for those pathways determined to be significant to the HHRA Observed contaminant distributions at OU 5 are the result of chemical and physical interactions between contaminants and the environmental media in which the contaminant resides These interactions involve processes that determine the transport and fate of contaminants in site soils sediments surface waters and groundwater These processes include but are not limited to adsorption/desorption reactions (including ion exchange) oxidation/reduction complexation precipitation/dissolution volatilization hydrolysis dehalogenation radioactive and chemical decay and biodegradation

Contaminant behaviors and mobilities as determined in the fate and transport models described in the following sections are derived from the physical and chemical properties of individual contaminants in the context of the physical and chemical properties of the site as determined from field and laboratory data collected for the specific media at OU 5 Each of the fate and transport models described below are capable of modeling the processes affecting contaminant mobility applicable to the medium/media being modeled The capabilities of the models are described in detail in TM13 (DOE 1994b) and are summarized in the following sections In all cases when model parameters affecting contaminant mobility were varied in order to achieve calibration the parameter estimates used were those that would provide the most conservative results for use in the HHRA

## 5 3 CHEMICAL FATE AND-TRANSPORT MODELING

The following sections discuss the procedures followed for the modeling of contaminant fate and transport in groundwater surface water and air and the results of this modeling For each modeling effort, the rationale used for selecting the specific numerical modeling codes is also discussed Additional detail regarding the selection of fate and transport models is provided in TM13 (DOE 1994b)

### 5 3 1 Groundwater Modeling

This section describes the groundwater modeling including flow and solute transport modeling in the groundwater system and simulation of contaminant transport in the vadose zone

#### 5 3 1 1 Purpose

The purpose of the OU 5 groundwater modeling was to provide an evaluation of contaminant transport via the groundwater pathway in order to support the OU 5 HHRA This purpose was satisfied by the production of a realistic representation of the subsurface system which was used to estimate contaminant concentrations at locations that are relevant to risk assessment. These locations include areas where potentially contaminated groundwater might flow into Woman Creek. The model area covered by the modeling is depicted on Figure 5-4

### 5 3 1 2 Scope

The scope of the groundwater modeling is limited to providing estimates of concentrations of COCs that originate in OU 5 IHSSs Concentrations are calculated at regularly spaced points in a grid that covers present and possible future contaminant plumes Radium 226 barium and manganese have been identified as the only COCs in groundwater (DOE 1995a)

### 5 3 1 3 Design

Buried ash and debris in OU 5 are potential sources for groundwater contamination The base elevations of some of these sources are located above the water table and are separated from the water table by unconsolidated surficial materials (such as colluvium) Consequently some contaminant movement is through unsaturated material above the water table (vadose zone) and the remainder of the subsurface transport pathway is within the saturated zone For the purposes of the present modeling numerical flow and transport modeling was used to simulate contaminant movement below the water table in the groundwater system A one-dimensional solute transport modeling code was used to represent contaminant transport above the water table (i e the vadose zone)

Selection of Model Codes Groundwater flow and contaminant transport modeling are combined to produce a representation of contaminant movement in a subsurface system Computer codes that perform the modeling are commonly called models Many types of models are available Mathematical models range from the solution of simple equations to very complex computer programs In general the greater the complexity of the model the closer its behavior approaches that of the actual system (Javandel 1984) Therefore more complex mathematical models tend to produce better estimates of the actual behavior of the system than simpler mathematical models The physical systems and processes can be more completely represented in complex models The selection of a mathematical groundwater model is guided by the complexity of the actual groundwater system, the amount and quality of data available and the degree of representativeness needed Model selection for OU 5 is discussed in detail in TM13 (DOE 1994b)

*Selection of the Groundwater Flow Model* The OU 5 groundwater system is complex There is a large amount of data for the groundwater system and a good representation of the groundwater system is appropriate due to the importance of the HHRA The risk assessment may be partially based on the results of groundwater modeling Consequently a complex mathematical model was selected for simulation of the groundwater flow system

The complexity of the groundwater flow system is caused by the following site conditions

- Location of the IHSSs on the slope of a valley wall where the surficial materials include heterogeneous colluvium landslide deposits and artificial fill which result in a wide range of hydraulic conductivity along the flow path
- Groundwater flowing downhill along an irregular bedrock surface
- Highly variable saturated thickness between the bedrock surface and the water table including some areas where the bedrock surface is consistently above the water table
- Complex water table configuration and
- Areal variation of groundwater recharge rate as indicated by different vegetation types

A complex numerical modeling code MODFLOW was selected to simulate the complex groundwater flow system in OU 5 MODFLOW is a widely used finite-difference modeling code developed by the U S Geological Survey (USGS) (McDonald and Harbaugh 1988) The simulated geologic medium is discretized into rectangular volumes (cells)

*Selection of the Contaminant Transport Model* The complexity of the factors affecting contaminant transport in the groundwater system is indicated by

- The irregular shape of IHSS 115 (Original Landfill)
- The irregular distribution of contamination in the groundwater and soils and
- The variation of contaminant concentrations in groundwater and soils

The numerical modeling code selected to simulate the complex transport of dissolved contaminants in the groundwater system was MT3D (Papadopulos and Assoc 1992) This code places imaginary particles into the flow system simulated by MODFLOW The particles are generated in cells that represent contaminant sources Multiple cells may be used to represent large irregularly shaped sources Each particle represents a certain mass of contaminant. These particles move with the groundwater MT3D can simulate variable rates of contaminant supply at the source The contaminant mass represented by particles in a cell at any given time may be converted to a corresponding contaminant concentration

*Selection of the Vadose Zone Model* The computer code selected to simulate the transport of contaminants downward from a buried source through the vadose zone to the water table was ONED 3 (Beljin and van der Heijde 1993) This code is a one dimensional solute transport model which uses a mass flux boundary condition at the upstream end of the model (Javandel 1984) This simple representation of contaminant transport in the vadose zone is conservative because it represents the shortest possible pathway to the water table It is compatible with the amount and quality of relevant data that are available for the vadose zone in OU 5 Although the actual OU 5 vadose system is complex a high degree of representativeness is not needed to produce conservative results

Model Code Verification MODFLOW has been successfully applied to many complex flow problems and is a widely used and well documented finite difference groundwater flow model supported by the USGS Verification of MODFLOW has been performed by comparing the numerical results with analytical solutions to the partial differential equation for groundwater flow through porous media (Anderson 1993) MT3D verification is described in Chapter 7 of the user s manual (Papadopulos and Assoc 1992)

### 5 3 1 4 Groundwater Flow Model

The preceding sections used the term model to refer to computer codes This section will use model to refer to the actual simulation of OU 5 conditions produced by using MODFLOW Usage of model is revealed by the context

Time Dependency Groundwater flow in the numerical model is treated as steady state The steady flow assumption significantly reduces the calibration effort compared to simulating transient flow and attempting to calibrate against time varying heads Furthermore steady flow modeling reduces the amount of input required by MT3D

The long term behavior of the groundwater system is adequately represented by steady conditions because transient short term fluctuations in the configuration of the water table will not significantly affect the long term movement of contaminants Only long term movement is relevant to risk assessment involving future COC concentrations in groundwater

Grid The model grid (Figures 5 5a through d) is extensive enough to include all of the IHSSs in OU 5 that were found to contain contaminants during the OU 5 RFI/RI field investigation The grid includes the reach of Woman Creek that passes through OU 5 and is aligned with the course of the creek Woman Creek receives groundwater inflow during high water table stages and may carry contaminated groundwater downstream mixed with surface water from other sources The grid also includes local features that could affect the groundwater flow system including the SID and Pond C 2 The French drain on the 881 Hillside is included as a no flow boundary

The grid contains only one layer which is sufficient to represent groundwater flow in relatively permeable surficial materials above the relatively impermeable claystone bedrock surface Bedrock is the undifferentiated Arapahoeand Laramie Formations which contain sandstone lenses however no significant thickness greater than 5 feet of permeable sandstone was found in contact with the surficial materials in OU 5 boreholes Therefore no representation of Arapahoe Formation or Laramie Formation sandstone is included in the model

The grid spacing near the IHSSs that are potential sources of groundwater contamination is 50 feet. The spacing is increased to 100 feet elsewhere in the model In accordance with accepted practice a transitional spacing of 75 feet is used between the small and large cells (Trescott, 1976) Using larger cells in the peripheral parts of the model has little effect on the model results Contaminant sources and plumes are not located in these areas so small cells are not needed for detailed solute transport analysis Hydraulic conductivity zones with dimensions less than 100 feet are not relevant and may be treated by using equivalent hydraulic conductivities (Freeze and Cherry 1979) applied to 100 foot distances

Model Boundaries The undifferentiated Arapahoe/Laramie Formation (claystone bedrock) underlying the surficial materials is relatively impermeable (EG&G 1995a) Consequently the base of the model was treated as a no-flow boundary The bedrock surface is uneven so this boundary is uneven

The model is composed primarily of active cells which represent the part of the model where groundwater movement is simulated The lateral boundaries of the active cells are shown in Figures 5 5a through d The boundaries approximate the OU 5 boundary on the north and west sides of the model The eastern boundary was placed so as to include effects of Pond C 2 and the Woman Creek diversion on groundwater flow to Woman Creek

The south boundary of the active cells follows Woman Creek west of Pond C 2 This boundary is a groundwater divide and is simulated as a constant head boundary This type of boundary is suitable because the average water table elevation at Woman Creek is within the limited range between the creek bottom and bedrock This limited range is indicated by average water level elevations in monitoring wells located near the creek It is also indicated by a seepage study that showed Woman Creek within OU 5 to be losing water most of the year (Fedors and Warner 1993)

Initially the active part of the model grid extended to the south of Woman Creek and the creek was represented by the MODFLOW river package However early model runs were not successful because the water table beneath Woman Creek is too close to the bedrock surface Consequently some cells at Woman Creek became dry during head oscillations while model runs were converging even when underelaxation was used This problem was solved by using constant heads in the cells following Woman Creek Because no contaminant sources are known to be present south of Woman Creek the southern part of the model became extraneous and these cells were inactivated

Most of the remaining boundary of the active part of the model is represented by constant heads because water levels at a boundary can be more accurately estimated than flux or a proportionality constant for the general head boundary package Estimation of the constant heads at boundaries is facilitated because the water table must be within the thin surficial deposits Furthermore heads are indicated by some monitoring wells that are present near the model boundaries

No flow boundaries were used where the model boundary is parallel to the water table gradient. A no flow boundary also follows the French drain on the 881 Hillside The drain is treated as completely effective in preventing downslope movement of groundwater

Bedrock Elevation Bedrock elevation throughout the OU 5 area was mapped using bedrock surface data from boreholes In areas of sparse coverage the thickness of surficial materials and the configuration of the land surface were considered when interpreting the configuration of the bedrock surface The model behavior is very sensitive to bedrock configuration because water flows downhill on the bedrock surface Consequently bedrock elevations supplied to the individual cells were transferred from the bedrock map (Figure 3 5) to the MODFLOW input file by hand to avoid any unrealistic values that might be generated by software interpolation and extrapolation

Hydraulic Conductivity Zones of initial hydraulic conductivity corresponded to the areal distribution of units on the Surficial Geologic Map of the Rocky Flats Site and Vicinity (Shroba and Carrara, 1994) Five surficial materials are mapped within the active model area. They are landslide deposits colluvium Rocky Flats Alluvium. Piney Creek Alluvium and artificial fill Landslide deposits and colluvium were lumped together in the initial hydraulic conductivity zones due to their similar origin and texture Consequently there were four zones of initial hydraulic conductivity as shown on Figures 5 6a through d

The initial estimate of hydraulic conductivity for the zones representing colluvial material and artificial fill was 0 0029 feet per day (ft/day) which is in the range of conductivity values for a silt matrix (Freeze and Cherry 1979) Shroba and Carrara (1994) describe the colluvial deposits as silty sand sandy silt, clayey silt and silty clay The textural composition of the fill is similar to the colluvium and landslide deposits

The initial estimate of hydraulic conductivity for the Rocky Flats Alluvium was 2 6 ft/day which is within the range of values reported for pumping tests and slug tests adjacent to OU 5 (about 0 005 to 8 8 ft per day)

The initial estimate of hydraulic conductivity for the Piney Creek Alluvium along Woman Creek was 34 6 ft/day This value is based on the geometric mean of late match drawdown in a delayed yield analysis of test data from a well near Woman Creek west of Pond C 1 (Doty and Associates 1992)

Recharge No site specific recharge studies are available to provide hard data for recharge estimates for OU 5 Consequently recharge was treated as a calibration parameter for OU 5 modeling Previous modeling studies at the Site have used recharge values ranging from 2 96 inches per year to 2 25 inches per year (DOE 1993k, EG&G 1993b EG&G 1994f Fedors and Warner 1993 ICF Kaiser 1993) However initial recharge estimates were made to begin the calibration with realistic recharge zones and relative recharge rates The initial recharge zones were based on vegetation types shown on the Rocky Flats Plant Vegetation Map (DOE 1992c Figure 3 2 3) Initial recharge estimates are presented in Table 5 1 These estimates are based on precipitation minus consumptive use for the period from May 1993 through April 1994 which is the period used to calculate the water table calibration targets described below Precipitation at the Site for the period was 14 73 inches (EG&G 1993a, 1994c) The monthly distribution of the precipitation is shown in Table 5 2 Figures 5 5a through d shows the initial allocation of recharge rates to the model grid Positive recharge indicates inflow to a cell Negative recharge indicates outflow from a cell and represents net extraction by phreatophytes The uncertainty associated with these recharge rates is large and they were changed during the model calibration However relative rates associated with the vegetation types were retained

The Blaney Criddle Method was used to estimate consumptive use for the initial estimates of relative recharge because the method is well established and documented In addition Blaney Criddle consumptive use coefficients have been published for many vegetation types including natural vegetation types that occur in semi arid regions Applicability of the Blaney Criddle Method at the Site was investigated by comparing potential evapotranspiration (PET) calculated by the Blaney Criddle method to PET calculated by the more elaborate Penman Method when Site climatic data are used. The Penman calculations were made by Koffer (1989) The Blaney Criddle calculations were made by employing the consumptive use coefficients for short green grass (Quackenbush and Phelan 1965) Results are shown in Figure 5 8 The plots for monthly PET are similar for the two methods except for an unexplained atypical data point for the month of May in the Penman curve

The consumptive use rates calculated by the Blaney Criddle method for the period May 1993 through April 1994 are shown on Table 5 3 These calculated rates correspond to water used by plants that are relatively well watered However much of the modeled area is a south facing hillside that becomes dry in the summer The grasses wilt and turn brown indicating the development of a soil moisture deficiency Experiments with grasses at Fort Collins Colorado have shown that grass remains green when irrigated at about 50 percent of the Blaney Criddle consumptive use rate and continues to live when moisture supply is only about 20 percent of that required for optimum growth (Quackenbush and Phelan 1965) Using this behavior as a guide a medial value of 33 percent of the calculated consumptive use rates in the dry grassland areas was used as a rough approximation of actual consumptive use Consumptive use by phreatophytes calculated by the Blaney-Criddle Method was adjusted upward (three percent increase) This adjustment is consistent with the slightly higher PET calculated by the more elaborate Penman equation for July through mid September (Figure 5 8)

When recharge rates shown in Table 5 1 are compared to the precipitation distribution in Table 5 2 and potential evapotranspiration shown on Figure 5 8 they suggest that groundwater recharge for the dominant dryland vegetation types may represent a large proportion of precipitation during the part of the year when evapotranspiration rates are low This calculated amount of recharge seems plausible however it could be greater than actual recharge because the soil moisture deficiency developed between precipitation events in the growing season is unknown

The hydrographs shown in Figure 5 9 are in general agreement with winter/spring recharge They show a tendency to have low water levels in the summer and a rise in water levels beginning sometime in the September to December interval Well 58793 is an exception It shows only a slight rise by March suggesting a more delayed response to recharge Actual recharge is unlikely to be much greater than the initial recharge estimates because the annual recharge approaches the measured amount of spring precipitation

Due to large values of PET (Approximately 40 inches per year ([Fedors and others 1993]) the recharge rates at the Site are probably considerably less that the spring precipitation Previous documented studies contain lower estimates of recharge Due to the uncertainty in the recharge estimate it was considered as a calibration parameter subject to restrictions obtained from previous modeling studies

Calibration Development of the groundwater flow model included calibration to representative water levels measured in monitoring wells Calibration involves modifying model variables that are not accurately known In the present model these calibration variables are hydraulic conductivity and recharge rate Modification of bedrock elevation and boundary heads was also necessary in some cells where they had not been measured The variables are changed in successive trial computer runs until the field measured hydraulic heads are adequately approximated by the model The values assigned to the variables must be within the ranges appropriate for the hydrologic and geologic conditions of the area. Calibration does not produce a unique solution to the problem of representing the actual system, because more than one combination of parameters may cause hydraulic heads to be approximated equally well However if adequate constraints are applied to the values of the variables calibration can produce a realistic solution for a complex problem. The representativeness of the solution may be judged by comparison of values assigned to model variables to measured values in the model area and to values reported in the scientific literature for similar subsurface materials and recharge conditions

If sufficient data are available the predictive capability of the model may be validated by testing its ability to predict heads that were not included in the calibration In the present case insufficient data are available to test the predictive capability of the flow model However an analysis of uncertainty in the contaminant concentrations predicted by the linked flow and transport model was performed

*Calibration Targets* Selection of calibration targets involved identifying a period when water levels were representative and water level data were relatively abundant The period selected was May 1 1993 to April 30 1994 Long term precipitation data from the Boulder Colorado station (NOAA National Climatic Data Center) shows that precipitation in 1993 was normal (Figure 5 10) Precipitation data for all of 1994 are not yet available Monitoring well hydrographs also indicate normal hydrologic conditions in 1993 1994 (Figure 5 11) Most of the existing monitoring wells and wellpoints in OU 5 were installed in 1993 and water level measurements from these wells and wellpoints are available for the period from May 1993 through April 1994

Target water levels are restricted to those wells screened in the surficial material and that record water levels above the bedrock top throughout the selected period Wells that satisfied this restriction were wells 5686 6586 7086 51193 58793 59493 and 59593 The locations of these wells are shown on Figure 5 5A Average water levels in the wells for the selected period were used as the target water levels Hydrographs displayed in Figure 5 9 show the degree of representativeness of the average water level for the selected period Departures from the mean are generally less than two feet and the mean is not affected by extreme values Wells that were consistently dry throughout this period were also considered in the calibration Consistently dry wells were 50192 50292 and 61293 Calibration included producing dry model cells at these well locations

Most of the water level data in the OU 5 area are from wells and wellpoints that do not satisfy the criteria for target water levels However data from these wells were considered semi-quantitatively in the calibration by calculating average water levels regardless of the period represented or the number of water levels available Dry measurements were not included in the average These averages were treated as secondary information for identifying any further modifications that should be made in model variables to obtain agreement with all available data.

*Calibration Procedure* The general calibration procedure was to start with initial estimates of the calibration parameters (hydraulic conductivity and recharge) and minimize deviations from them. Water level elevations on the hillslope were found to be sensitive to bedrock configuration and boundary heads and some adjustment from initial estimates in certain cells was also required The initial estimates of values for the calibration parameters were based on analysis of available climatologic hydrologic and geologic data. This calibration procedure is equivalent to estimating the parameters of the groundwater flow system and then improving the estimate via model calibration If sufficient site specific data are available for the calibration parameters (hydraulic conductivity and recharge) and geologic controls (bedrock elevation) the expected result is a realistic model

The first phase of the calibration involved adjusting parameter values to produce calculated water levels below land surface elevations throughout the model Model parameters were adjusted after successive modeling runs until all heads were below land surface elevations Boundary conditions were also altered during the first phase of the calibration The southern boundary of the model consisted of constant heads in the southernmost row of the model with Woman Creek simulated by the MODFLOW river package However as discussed in Section 5 3 1 4 some river cells contained bedrock elevations estimated at only a foot below the streambed elevation These cells converted to dry cells prior to completion of the modeling run The dry cells produced by the numerical process resulted in unrealistically high calculated heads north of Woman Creek When riverbed conductance (capacity to transmit water) was increased to prevent the conversion to dry cells the model did not converge Consequently cells along the course of Woman Creek were converted to constant head cells to obtain better results Cells south of Woman Creek were inactivated For cells along reaches of the creek that lose water most of the year the head was initially set 0 5 feet below the stream bottom elevation For cells along reaches classified as gaining the head was initially set 0 5 feet above the bottom elevation Gaining and losing reaches were based on results of an infiltration/exfiltration study conducted from December 1991 through October 1992 (Fedors and Warner 1993) Setting heads 0 5 feet below the elevation of the stream bottom is consistent with a field search that revealed no bedrock exposed at the stream The initial constant heads were subject to change during subsequent calibration runs if necessary to adequately simulate heads measured in observation wells near the stream

The change of the southern model boundary condition did not represent a significant change in representativeness and usefulness of the model The change eliminated riverbed conductance as a calibration parameter that would have to be adjusted to produce heads in the river cells Instead heads were supplied directly as a constant head boundary Groundwater flow south of the creek is not needed for solute transport analysis because no contaminant sources were identified there by soil borings during the OU 5 field investigation

Additional convergence problems were caused by cells converting to dry cells during the modeling runs if the wetting capability in the BCF2 package was inactive However when wetting capability in BCF2 was activated wet/dry oscillations were produced. To eliminate this oscillation, BCF2 wetting was inactivated and extreme under relaxation (dampening of head oscillations) was used in the model to prevent drying of cells early in the simulation run Calculated heads near dry cells were inspected on spreadsheets during the calibration process When dry cells produced by calibration runs were not realistic and caused adverse effects on the calibration model parameters were modified to increase flow to these cells

During the first phase of calibration hydraulic conductivity in the initial zone 1 (colluvium and landslide materials) was increased from the initial value of 0 00288 ft/day to 7 0 ft/day west of Pond C 2 and to 1 152 feet per day east of Pond C 2 Zone 2 (fill) was increased from an initial value of 0 00289 ft/day to 0 185 ft/day These increases in hydraulic conductivity are within the range expected for these materials These changes reduced heads in hillslope areas throughout the model A new zone was created from zone 1 east of the Woman Creek diversion around Pond C 2 to reduce heads east of the pond The hydraulic conductivity initially assigned to this zone was 5 76 ft/day Heads east of Pond C 2 were also reduced by extending the initial zone 4 (alluvium) to cover alluvial material shown on a worms eye map of geologic materials present at the bedrock surface (EG&G 1995a) In addition constant heads along Woman Creek east of Pond C 2 were reduced to 0 5 feet above bedrock Other minor adjustments were made to bedrock elevations and constant head boundaries to reduce water levels below land surface in local areas Hydraulic conductivity in the zones representing colluvium landslide material and fill was adjusted further in local areas

During the first phase of calibration the effectiveness of reducing recharge to reduce heads was tested by setting recharge zones 6 8 and 9 (grassland and disturbed areas on the hillside) to zero The effect on water levels south of the east end of the Original Landfill near cell (17 51) (row column) showed that although the head in the cell (17 51) was reduced by 6 feet it was still 2 feet above the land surface It was necessary to increase hydraulic conductivity in the area to reduce the head to below land surface Because this test showed that recharge adjustment was less effective for calibration than varying hydraulic conductivity recharge was subordinated to hydraulic conductivity as a calibration parameter

The goal of the second phase of the calibration was to reduce deviations of calculated heads from target heads and to produce dry cells where monitoring wells are consistently dry This phase primarily involved local adjustment of hydraulic conductivity to raise or lower calculated heads corresponding to individual target heads In addition constant heads were adjusted along some reaches of Woman Creek and localized sections of the northern boundary Phase 2 produced a model in which all interpolated heads were within a half foot of heads in target wells and dry wells were represented by dry cells This is a high degree of calibration The root mean squared residual is 0 22 (Table 5 4) whereas a good calibration would only require the statistic to be less than 2 0 This calibration criterion is based on the dimensionless error variance measure of goodness of fit (Cooley 1977) and calibrated models described in Anderson and Woesener (1991)

The third phase of the calibration was a refinement in which water level information from miscellaneous wells and wellpoints was used to check the representativeness of the model Data from an additional 49 water level observation points were assembled and average water levels were calculated These averages represented different periods included variable numbers of measurements and did not include instances when wells were reported to be dry Although such information at any point does not necessarily provide a good representation of long term water levels the model should be compatible with them Consequently the averages were placed in a HeadCompare (Papadopulos & Assoc 1993) input file as secondary observed water levels Interpolated model heads were compared to these secondary water levels to identify observation points where model heads were not compatible with miscellaneous observations

One point of incompatibility was at well point 62893 in cell (6 83) which measured water levels in a wet area This wet area is believed to be caused by an impedance to groundwater flow from downslope decreases in hydraulic conductivity Simulated heads were too low at this location and hydraulic conductivity was decreased in a new zone downslope to reflect the probable cause for the wet area. New hydraulic conductivity zones were also introduced to obtain better model results by increasing water levels in the vicinity of well point 52193 in cell (20 34) and well point 53292 in cell (12 72) and by decreasing water levels near well 52693 in cell (14 62)

Constant heads at Woman Creek were changed near wellpoints 53593 53993 and 54793 in cells (21 96) (13 107) and (8 135) respectively to reflect their proximity to the creek. Additional miscellaneous changes in constant heads and local hydraulic conductivities were necessary to maintain calibration in the target wells and deal with minor calculated head incompatibilities with the secondary data points

The third phase also involved improving the agreement between model hydraulic conductivities and hydraulic conductivities from aquifer tests that were conducted within the active area of the model The hydraulic conductivity in cell (13 68) was reduced from 7 0 to 6 0 ft/day to obtain agreement with a slug test in well 59593 Hydraulic conductivity near well 51193 was changed to 15 ft/day which agrees with pumping test results and treats the cells as being transitional between nearby cells that were 34 56 and 7 0 ft/day The transitional nature of this area could be caused by the presence of alluvium in the area covered by the cell The third phase produced a well-calibrated model however the hydraulic conductivity of much of the colluvium that covers a large part of the model area remained at the high value introduced in the first phase of the calibration

High values for hydraulic conductivity were used to reduce water levels at this early calibration stage because reducing recharge rates to zero did not produce adequate water level reduction. The final phase of calibration was an adjustment so that hydraulic conductivity in the colluvium agreed with pumping test results obtained from colluvium on the 881 Hillside (there were no successful pump tests for colluvial wells within the active model area) The 881 Hillside is located north of the middle part of the active model Much of the colluvium in the model remained at the value of 7 0 ft/day set in phase one of the calibration However the average hydraulic conductivity for drawdown recovery tests reported for the 881 Hillside is 0 95 ft/day To bring hydraulic conductivity of colluvium in the model into better agreement with this value hydraulic conductivities throughout the model were divided by 7 0 to bring the large areas of colluvium down to 1 0 ft/day All recharge values in the model were also divided by 7 0 to maintain the calibration The resulting recharge values were still within the range of possible values because uncertainty associated with the initial values was large A few additional changes in model hydraulic conductivity values were made to maintain agreement between model hydraulic conductivity values and pumping test results within the active part of the model Minor adjustments in model parameters were also made at this time Some boundary heads were changed to bring them into better agreement with monitoring well data and hydraulic conductivities and recharge rates were changed in a wet area near the east end of the Original Landfill where particle tracking indicated that the shape of a hydraulic conductivity zone was not natural The resulting hydraulic conductivities and recharge rates were still within realistic ranges throughout the model and this result was accepted as the calibrated flow model

*Calibration Results* The degree of calibration produced by the modeling is indicated by Table 5 4 The maximum residual for target water levels is 0 27 feet The degree of correspondence between calculated heads and secondary water levels is shown by Table 5 5 The largest absolute residual for a secondary water level is 6 54 feet for well point 60693 This well point is only 78 feet from well point 60593 which has an absolute residual of only 1 12 feet These wellpoints have only two water level measurements each and are in an area with a relatively steep sloping land surface Well 63093 has a residual of 6 46 ft It has only two measurements and is 82 feet from well 51493 which has 10 measurements and an absolute residual of just 0 20 feet Well point 54193 has an absolute residual of 5 70 feet. It is only 28 feet from 54093 which has an absolute residual of just 0 35 feet. Both 54093 and 54193 are in the same 50 x 100 foot model cell The model is not intended to represent such small scale hydrologic features Well point 62793 has an absolute residual of 5 20 feet Its water level is based on only two measurements taken at about the same time The well is along the same topographic contour as well 59793 which is about 75 feet away and has a residual of 2 48 Because one of the calculated water levels is higher than the measured one and the other is lower than the measured one the model results are reasonably representative The remainder of the residuals for secondary water level data indicate that the model results are compatible with the secondary data considering the data distribution in space and time

The final distribution of hydraulic conductivity values in the model is shown on Figures 5 12a through d and Table 5 6 A detailed map of hydraulic conductivity is in Appendix F The initial four zones of hydraulic conductivity which ranged from 0 00288 ft/day for colluvial and landslide material to 34 56 ft/day for alluvium evolved into 25 zones ranging from 0 014 ft/day in a heterogeneous area in the south central part of the Original Landfill to 29 ft/day for alluvium east of Pond C 2

The final range of hydraulic conductivity in colluvium and landslide areas is 0 0357 to 28 6 ft/day The calibrated value of 2 86 and 0 063 ft/day were applied to zones in the vicinity of Ash Pit IHSSs 133 1 and 133 2 respectively As previously stated most of the colluvium and landslide area in the model was assigned a hydraulic conductivity of 1 00 ft/day These values for colluvium are in the range of expected values for silt and silty sand given by Freeze and Cherry (1979) and are compatible with the description of the colluvium In addition hydraulic conductivities corresponding to alluvial material were expanded into the area originally treated as colluvial ~~and landslide~~ material near Woman Creek This expansion suggests that alluvium is present beneath colluvium at a few places near the creek The final range of hydraulic conductivity in artificial fill was 0 0143 to 0 929 ft/day which is consistent with some of the fill composed of disturbed and compacted colluvium

The final range of hydraulic conductivity of alluvium near Woman Creek was 4 94 to 28 6 ft/day The final range of hydraulic conductivity for Rocky Flats Alluvium was 0 357 to 0 429

The final bedrock configuration is shown in Figures 5 13 A through D 5 14 and 5 15 The model was sensitive to bedrock configuration because the groundwater is flowing down the bedrock slope through thin surficial materials Recharge zones and recharge rates resulting from the calibration are shown in Figure 5 14 and Table 5 7 The simulated water table configuration is shown in Figure 5 15 which also reflects the final constant head values in boundary cells

Water Budget The water budget for the model is shown in Table 5 8 The inflow from constant head cells is nearly all from the cells along the northern boundary of the model and represents groundwater from upslope areas This contribution is from groundwater flowing along the bedrock surface that slopes southward toward the OU 5 area.

Nearly all outflow to constant head cells is to cells along the southern boundary of the model This boundary follows Woman Creek and the outflow represents discharge of groundwater to the stream during periods of high water table when the stream is gaining It represents an average flow of 0 036 cubic feet per second or 26 6 ac ft/year In the real system this water would evaporate from Ponds C 1 and C 2 or be carried around Pond C 2 by the Woman Creek diversion Actual discharges for Woman Creek in the Pond C 1 and C 2 area range from about 300 to 1975 acre feet per year corresponding to 0 4 to 2 72 cubic feet per second (ASI 1991) The simulated water budget represents a minor contribution to Woman Creek flow

Particle Tracking Results of particle tracking are shown in Figures 5 16a through d The particle tracking was performed using MODPATH (Pollock 1989) This software uses output from MODFLOW to compute the path and rate of movement of water from selected source locations Although particle tracking does not include the effects of dispersion it provides a good overview of the nature of the flow system and potential rate of contaminant movement It is helpful in identifying the sources for contaminants observed in groundwater and provides initial information on the rate of contaminant movement

Estimates of effective porosity must be supplied to MODPATH in addition to the output from MODFLOW The effective porosity estimates used to produce the particle tracks are shown on Table 5 6 They are based on a general relationship between specific yield and hydraulic conductivity (Luthin 1966 Figure 10 10) Specific yield is similar to effective porosity (Fetter 1980) Effective porosity in each cell of the model was determined by the hydraulic conductivity in the cell As shown in Table 5 6 these effective porosities ranged from 0 01 for the lowest hydraulic conductivity (0 0143 ft/day) to 0 19 for the highest hydraulic conductivity (2 86 ft/day)

The particle tracks show that the groundwater flow rate is variable throughout the model area and that paths are deflected around areas of relatively low hydraulic conductivity Pond C 2 captures groundwater from sources to the west of the pond Groundwater originating east of Pond C 2 including seepage from the Woman Creek Diversion moves toward Woman Creek where it exits the eastern edge of the model

### 5 3 1 5 Solute Transport Model

COCs in Groundwater In order to assess the potential risk to human health from exposure to OU 5 groundwater constituents of the groundwater were evaluated as potential chemicals of concern TM11 (DOE 1995a) defines COCs as metals or radionuclides whose concentrations exceed background concentrations and organic chemicals present at levels greater than analytical detection limits Eleven groundwater constituents were identified as COCs for OU 5 including five metals and six radioactive elements (DOE 1995) They are aluminum barium manganese vanadium beryllium, americium 241 plutonium 239/240 radium 226 uranium 233/234 uranium 235 and uranium 238 Further discussion of the COCs and the methods of their selection are provided in TM11 (DOE 1995a)

*Target Wells* As potential calibration targets for solute transport modeling OU 5 wells were evaluated with respect to the eleven COCs Only 1993 analytical data were used in this evaluation corresponding to the time period selected for the flow model calibration All analytical data for dissolved constituents in groundwater collected from OU 5 RFI/RI wells were reviewed for occurrences of the COCs Of these data results flagged as rejected (R) laboratory replicate (LR) field blank (FB) trip blank (TB) and rinsate were removed from the data set. Additionally duplicates were averaged with the corresponding real samples and all results listed as non detects were set at values of one half the detection limit (DOE 1995a) To detect the presence of a COC in concentrations that satisfactorily set it apart from the background population well maxima for each COC were screened for values above background mean plus two standard deviations This screening provides a means of identifying chemicals that are present in concentrations greater than most of the background population and which therefore may reflect actual contamination The screening procedure resulted in the identification of three COCs barium, manganese and radium 226 The eleven COCs the screening values the well means and the results of the screening procedure are presented in Table 5 9

<u>Target Concentrations.</u> Inspection of the 1993 data for the COCs showed no general trends in concentration over time (Table G 1 Appendix G) During this relatively short period the observed concentration in each well was sufficiently stable that any general temporal trend that may exist was too small to separate from the scatter of the data. The scatter of the data at each well may be caused by many factors including short term variation in groundwater recharge rate variation in source concentration and geochemical variability of the aquifer system combined with temporal variation in flow direction and rate In such aquifer systems the population of random variations in concentration at an observation point might be expected to be approximately normally distributed about a central value (Mood and Graybill 1963) This central value (population mean) is the most representative value because concentrations near this value will be most frequently observed Because a sample mean is an unbiased estimate of the population mean the mean of observed concentrations for each contaminant at a well was used to generate a target value at that well

The chemical specific means from each well were compared to the background mean of that chemical Target concentrations for each COC were established by subtracting the background means from the well means Those means that were found to be greater than the background mean were used as calibration targets Those that fell below background mean were considered zero for the purposes of calibration This second screening resulted in targets for the three COCs This information is presented in Table 5 10 Borehole logs and completion details of the target wells 58793 59493 59593 50092 and 51193 are presented in Appendix H

Sources for COCs In order to identify potential sources for the three COCs the following documents were reviewed

- Historical Release Report for the Rocky Flats Plant, EG&G Rocky Flats Volume I Text, Manual No 21100 TR 12501 01 June 1992 Pages SE 1 to SE 14 SW 1 to SW 16 400-1 to 400 2 800 1 to 800 2 900 1 to 900 2 and 900 10 to 900 12
- Health Studies on Rocky Flats Phase 1 Rocky Flats Toxicologic Review and Dose Reconstruction Task 3/4 Draft Report, ChemRisk February 1992

In the sections reviewed in the Historical Release Report (HRR) (EG&G 1992i) there is no mention of spills or releases of radium 226 barium or manganese or chemicals containing these constituents There are however several references to depleted uranium sources which may account for the presence of radium 226

Neither barium nor manganese are contained in the list of materials of concern as selected in Task 2 of the Health Studies on Rocky Flats Manganese is not referenced anywhere in the HRR. However barium is mentioned once in the document as barium chromate listed on the 1988/89 inventories of the chemicals for buildings 559 and 771 One pound was reported in a utility room in Building 559 and another pound was reported in Room 180F in Building 771

From this review no distinct sources of barium or manganese have been identified It appears unlikely that the barium chromate located in the buildings in 1989 would be a possible source of barium However if its earlier presence on site were undocumented that occurrence could be a source No source of manganese related to plant operations was identified

*IHSS 115* The three COCs in the Original Landfill (IHSS 115) wells appear to be related to the same source the northernmost former filter backwash pond Pond 6 (IHSS 196) Wells 59593 and 59493 are on the same particle track (Figure 5 16) originating at the site of the former pond Well 59493 has a mean of 1 03 pCi/l for radium 226 and well 59593 has a mean of 0 56 pCi/l for radium 226 These values are consistent with the supposition that the pond is the source of the radium 226 and that well 59493 is closer to the source than 59593 This relationship is also supported in the manganese means of 6 130 $\mu$g/l in well 59493 and 575 7 $\mu$g/l in well 59593

Pond 6 is mentioned in a discussion of the Southwest Buffer Zone Section 3 4 of the HRR (EG&G 1992i) as PAC reference number SW 196 (IHSS 196) the backwash pond for the water treatment plant. This pond apparently originated as an evaporation/settling pond and was used for the backflushing of sand filters from the Waste Treatment Plant located north of the Original Landfill The location of the pond is noted as about 800 feet south of Building 124 this is consistent with TM15 (DOE 1994a) maps but not with the HRR map The site of the pond may have originally been used as an incineration pit for the burning of contaminated waste from Building 444 and also as a dump site for ashes from the plant incinerator graphite used caustic drums and general trash The area was probably used as a burn pit for only one or two years (1952 1954) prior to the construction of the evaporation/settling pond between January and March 1955 (EG&G 1992i) A likely source of the radium is the incinerator ash derived from uranium contaminated (depleted uranium) waste from Building 444 although radium 226 is not noted There is no estimate of the mass of uranium in the HRR.

Well logs from 59493 the well constructed within the Original Landfill at the south end of the Pond 6 indicate that landfill debris including graphite and broken glass extend to within 1 2 to 2 2 feet above bedrock (bedrock at 14 1 feet) The water table was two feet below ground surface during drilling in June 1993 and was five to six feet below ground surface during pump testing in August 1993 (DOE 1994a) This is interpreted to mean that the source is below the water table The area of the former pond as shown on TM15 maps is based on aerial photography and is estimated as 45 feet in diameter and circular in shape The size is very close to that of the model cell size in the Original Landfill area, 50 feet by 50 feet.

*IHSS 133* The relationship of the COCs in well 58793 to a source in the north ash pit of IHSS 133 2 is supported by the particle tracks generated by MODPATH (Figure 5 16) In addition the presence of radium is consistent with the history of the ash pit, in that ash buried in the pit contained depleted uranium (EG&G 1992i) and ash sample monitoring in 1956 showed 1 9 grams of depleted uranium per kilogram of ash (1 7 kilograms/ton) The south ash pit is not modeled as a source even though target well 58793 is located just to the south and downgradient of the south ash pit The pit does not show up on a time domain electromagnetic survey and therefore probably does not contain metal (DOE 1994a) Additionally borings in the south trench did not encounter ash material (DOE 1994a)

The HRR describes the pits as trenches 150 to 200 feet long 12 feet wide 10 feet deep and covered with 3 feet of earth However the HRR also contains documentation of a trench as eight feet deep with six feet of compacted ash and two feet of earth cover The ash pits/trenches were in use from 1959 1968 The HRR does not indicate when each trench was filled but the 133 2 pit is not present in 1966 aerial photography and is present with no apparent overgrowth in a 1969 photograph The trenches were closed in 1968 The 133 2 trench was probably opened in 1967 This year will be used as the time of contaminant introduction to the vadose zone giving a total transport time of 26 years to the end of 1993 (the midpoint of the modeled period)

Logs of boreholes 56893 and 56993 (DOE 1994a) within the trench indicate that ash is present 2 4 to 7 7 feet below ground surface (6019 7 6025 0) in 56893 and 4 0 to 8 7 feet below ground surface (6016 3 6021 0) in 56993 giving an average thickness of fill of 5 0 feet This number is somewhat consistent with the trench design fill depth of six feet mentioned above No ash was encountered in the third of the three boreholes in the trench borehole 57093 However the borehole is located along the northern edge of the approximately 200 foot long and 40 to 45 foot wide trench depicted on TM15 maps and may be outside of the area containing waste Based on information provided in the HRR and borehole data the source appears to be a volume 175 feet long five feet thick and 12 feet wide

*IHSS 142* The target wells for IHSS 142 are wells 51193 and 50092 both located immediately east of Pond C 1 dam near Woman Creek Because the wells are downgradient from the pond, it is postulated that Pond C 1 is the source of contaminants found in these wells A boring through the center of the dam (Merrick & Company 1992) indicates that the dam is not keyed to bedrock in fact, approximately eight feet of unconsolidated material underlies the clayey gravel of dam fill strongly suggesting a hydraulic path for contaminant transport from the pond

Radium 226 can be traced back to Pond C 1 as a source particularly because Pond C 1 sediments contain americium plutonium and uranium. Uranium 238 is a COC for surface water in OU 5 The first introduction of uranium is not known Reported occurrences include the following

- In October 1954 backwash water drained through the Original Landfill burning pit down to Woman Creek The pit was used as a dump for uranium-contaminated incinerator ash and for burning of contaminated waste from Building 444 (used for manufacture of uranium and beryllium components)
- A steam condensate release (2 700 gallons) from Building 881 to Pond 7 and Pond 7 overflowed to Pond C 1 This release occurred in September 1955 Building 881 housed enriched uranium components
- Drainage from the 903 Pad area occurred over its lifetime from 1955 or 1958 through June 1968 Waste stored at the 903 Pad included uranium from Building 444 (depleted uranium)

Vadose Zone Transport Logs of materials encountered in boreholes 56893 and 56993 indicate that constituents released from Ash Pit 133 2 must traverse about nine feet of material in the vadose zone to reach the water table (DOE 1994a) Nine feet is the distance from the elevation of the bottom of ash in borehole 56993 to the elevation of the water table calculated by MODFLOW Transport through this vadose zone was simulated with a one dimensional model as described in Section 5 3 1 1

A simulation using the distribution coefficient of 0 67 ml/g which corresponds to the radium 226 distribution coefficient in the calibrated MT3D model and a downward seepage velocity of 0 0013 ft/day showed that the radium 226 would not yet have arrived at the water table by 1993 The downward seepage velocity was calculated from

$Q_{pw} = Q_r/n$ in which
$Q_{pw}$ is the seepage rate (L/T)
$Q_r$ is the groundwater recharge rate (L/T) and
n is effective porosity (dimensionless)

The groundwater recharge rate was set at 0 0002286 ft/day (from the calibrated MODFLOW run) and n was 0 03 the effective porosity from Table 5 6 and Figure F 1 Appendix F

The mechanism for rapid transport of COCs through the vadose zone beneath the ash pit has not been investigated and is not known For the present modeling the rapid transport was simulated by reducing the distribution coefficient to zero This simulation shows the 50 percent C/C concentration arriving at the water table in about three years (Figure 5 17) Based upon this result, MT3D source loading beneath the ash pit was initiated three years after the ash pit was constructed Because the ash pit was constructed in 1969 the impact to groundwater was assumed to begin in 1972 for purposes of the MT3D simulations The MT3D source loading rate was considered to be constant from 1972 onward

Transport Model The MT3D simulation of contaminant transport in the groundwater system is described in this section

*Interface with Groundwater Flow Model* MT3D requires values for discharge across each cell face as a model input. These discharges are derived from the flow model MODFLOW/mt, an enhanced version of

MODFLOW provided with MT3D contains an interface package LinkMT3D LinkMT3D allows MODFLOW to write heads and fluxes along cell faces into an unformatted file which is then used as an input file to MT3D

*Grid* The same grid that was used for MODFLOW was used for MT3D facilitating linkage of the models The size of the MT3D model was reduced by making irrelevant cells located west (upstream) of the IHSSs inactive

*Model Boundaries* The MT3D boundaries are the same as those used for the MODFLOW model The constant heads along Woman Creek allow movement of COCs out of the system.

*Stress Periods* The model execution consists of two stress periods for each COC The first stress period is 18 years (6574 days) in length beginning in 1952 when Pond 6 (IHSS 196) was first used as an incinerator pit The stress period ends (and the second begins) with the arrival of COCs at the water table beneath the ash pit in IHSS 133 2 in 1970 This second stress period lasts 24 years to the mid point of the RFI/RI investigation in 1994

*Calibration* The numerical solute transport model was calibrated by adjusting input parameters to produce simulated concentrations that were close to target concentrations for the wells identified as containing COCs Professional judgment was used to decide when the simulated concentrations were close enough to target concentrations to support human health risk assessment. A separate calibration was performed for each COC (radium 226 barium and manganese) The simulated plumes from Pond 6 (IHSS 196) and Ash Pit 133 2 are independent. Changing the source concentration for one plume does not affect concentrations in the other

The calibration for each COC was a two step process First the distribution coefficient was adjusted by successive trials until the ratio of simulated concentration values in the two wells in the Pond 6 (IHSS 196) plume approximated the ratio of the target concentration values in the two wells Second, the source concentration values for each plume were adjusted by multiplying them by the ratio of target concentration value to calculated concentration value at wells in the plume Calculated and target concentrations will match when this procedure is followed

The initial estimate of longitudinal dispersivity was 45 feet This estimate was based on the formula $\alpha_l = 0.1L$ where $\alpha_l$ is longitudinal dispersivity and L is the contaminant travel distance This scale dependence is discussed by Walton (1985) and Droppo and others (1991) In the present case the travel distance was taken as 450 feet which is the distance from Pond 6 to the farthest observation well containing radium 226 activities above background well 59593 The ratio between longitudinal and transverse (lateral) dispersivity was set at $0.2\alpha_l$ which is consistent with the recommendation of Droppo and others (1991) and with ratios given by Walton (1985) The effectiveness of adjusting dispersivity for calibration was examined by increasing longitudinal dispersivity by one order of magnitude while holding the initial distribution coefficient constant at 100 ml/g (Table 4 1 Strenge and Peterson 1989) This change resulted in a decrease in the computed ratio between wells 59493 and 59593 from 1 66E6 to 182 8 The observed ratio is 2 9 Therefore no combination of dispersivity and source loading could produce the desired ratio because source loading will have no effect on the ratio Calibration cannot be achieved solely by manipulating dispersivity Consequently the dispersivity was returned to its original estimated value which is consistent with published scale dependent values This dispersivity was retained throughout the calibration. The results of the calibration are presented in Table 5 11 The computed concentrations for well 59493 were interpolated from the four adjacent cell nodes because the well is located where the concentration gradient is high Other wells were adequately represented by calculated concentrations at the nearest node

*Analytical Transport at Pond C 1* Simulation of contaminant transport from Pond C 1 was accomplished by one dimensional analytical modeling using ONED 3 This procedure was adopted because the transport from the pond is along the bottom of the Woman Creek valley which is represented by constant head boundary cells in the MT3D model MT3D does not simulate transport in the boundary cells The one dimensional analytical simulation is conservative because it does not include the dissipation produced by transverse dispersion The results of the calibration to wells downstream from Pond C 1 are shown in Table 5 11 No useful data were found on total contaminant mass deposited in the source

*Future Concentrations* The calibrated solute transport models were used to calculate future concentrations of COCs in groundwater near Woman Creek. Concentrations were calculated for thirty years from the present, based on exposure duration guidance in accordance with Risk Assessment Guidance for Superfund (RAGS) (EPA 1989 Chapter 6 0) The greatest calculated thirty year concentrations are for cells located along Woman Creek (Table 5 12) These represent the greatest concentrations for groundwater that would flow into Woman Creek from the model area during high groundwater stages when the creek is gaining water in the reach through OU 5

These concentrations were calculated by extending the simulation period of the calibrated transport models by 30 years The source loading obtained in the model calibration was treated as remaining constant for the 30 years so the only input variable changed was the duration of the simulation period the use of undiminished source loading is conservative because it neglects the possible effects of source depletion and decay

Uncertainty Analysis Uncertainty is caused by various attributes of the models The hydrogeology conceptual model while attempting to account for what is known about the OU 5 hydrogeologic system may not actually reflect reality Some uncertainty in the results of the groundwater flow and transport modeling is caused by uncertainty in the variables that must be input, including hydraulic conductivity groundwater recharge distribution coefficients and dispersivities The finite-difference approximation of the groundwater system also contributes to uncertainty because the finite-difference representation of the system is much simpler than the real groundwater system Additional uncertainty arises from the non unique model calibration which can be achieved with more than one set of values for the variables

The uncertainty in the COC concentrations was accounted for by calculating worst-case concentrations for each COC The worst case is represented by the greatest 30 year concentration at Woman Creek that is not improbable This worst case approach requires calculation of an upper limit for the concentrations at Woman Creek The upper limit was calculated using a statistical procedure The general procedure was the following

1 The plume that produced the greatest 30 year concentration at Woman Creek was identified
2 Observation (target) wells near the axis of the plume were identified
3 Where two observation wells were near the axis the well nearest Woman Creek was selected for statistical analysis
4 The 95 percent confidence interval for the mean of the reported concentrations of each contaminant was calculated
5 The maximum likely concentration for each contaminant at the observation well was calculated by adding the confidence interval to the mean concentration.
6 The ratio of maximum likely concentration and mean concentration was calculated

7 The MT3D model was run for each COC until its concentration at Woman Creek reached a steady state (would not increase whatever the duration of the model run)

8 The greatest steady state concentration at Woman Creek was multiplied by the ratio calculated in item 6 to produce the maximum likely concentration (i e the worst-case concentration)

In step 1 the greatest 30 year concentration was chosen because it corresponds to the greatest risk In step 2 observation wells near the plume axis were selected because concentrations from such wells are more representative of the variation of maximum concentrations In step 3 more than one reported concentration is required for calculation of the 95 percent confidence limits for the mean The 95 percent confidence interval for the mean was calculated using a sample variance and the t-distribution with a critical region of 0 025 (two tailed test) This test is described in Dixon and Massey (1957)

Regarding steps 4 5 and 6 the 95 percent confidence interval is conservative because the probability of a measured concentration exceeding the upper confidence limit is only 2 5 percent, if the population is normally distributed If no well in the plume had more than one concentration measurement, then the concentration of the well nearest the axis was multiplied by ten to get the maximum likely concentration (Smith 1989)

In step 7 the steady state concentration is equal to or greater than the maximum calculated 30-year concentration at Woman Creek. It also implies that the leading edge of the plume has intercepted the creek, so that the worst-case groundwater velocity is considered Consequently using the steady state concentration is conservative

Step 8 yields the worst case concentration because the ratio of the maximum likely concentration to the calculated concentration is the same at any point in the steady state portion of a plume The results of the uncertainty analysis are shown in Table 5 13 The degree of uncertainty in concentrations that are related to human health risk is indicated by the differences in worst-case concentrations and greatest thirty year concentrations reported in Table 5 12 In general differences are less than an order of magnitude

### 5 3 2 Surface-Water Modeling

This section documents the surface water chemical fate and transport model and parameters used COCs analyzed and the statistical results of the simulation models runs over multiple 30 year time periods

#### 5 3 2 1 Purpose

The objectives of the OU 5 surface water modeling of the Woman Creek watershed are as follows

- To characterize the general surface water system of OU 5 using a semi regional scale surface water flow and transport model
- To support the HHRA portion of the RFI/RI for OU 5 This was accomplished by simulating the transport of COCs from OU 5 to potential exposure points for human receptors under present and anticipated future site conditions and as needed for ecological receptors
- To support the evaluation of potential remedial alternatives for the FS at OU 5

#### 5 3 2 2 Scope

The scope of the surface water modeling is limited to providing simulated concentrations of the COCs detected within the OU 5 Areas of Concern (AOCs) Concentrations have been simulated at various points along the Woman Creek thalweg for which there are documented stream gage and water-quality data. These points were chosen in order to calibrate the model to observed data.

Once calibrated the surface water model was used to simulate COC concentrations based on thirty different 30 year climatological time series The daily mean concentration of each of the time series was determined for each of the COCs From these thirty daily means one mean concentration was determined for each COC This process was performed for eleven COCs americium 241 barium copper lithium mercury plutonium 239/240 strontium, uranium 233/234 uranium 235 uranium 238 and zinc

#### 5 3 2 3 Description of Modeled Area

<u>Woman Creek Watershed</u> OU 5 is located within the Woman Creek drainage basin (Figure 5 18) which generally trends west to east Although seasonal flows can be low Woman Creek receives continuous flow from Antelope Springs Creek. Detention Ponds C 1 and C 2 are located within the eastern reach of the Woman Creek basin Pond C 1 is located on the Woman Creek channel whereas Pond C 2 is located off the Woman Creek channel Pond C 2 receives relatively minor local flow from its surrounding drainage basin It receives the majority of its flow from the SID located on the northern flank of the Woman Creek basin Woman Creek drains OU 5 and discharges via Mower Ditch into Mower Reservoir During periods of high flow Woman Creek may discharge directly to Standley Lake

The Smart Ditch South Boulder Diversion Canal Rocky Flats Lake and Coal Creek are water storage and/or conveyance facilities located near the upper part of the Woman Creek watershed Rocky Flats Lake collects irrigation flows from the Last Chance ditch for storage before discharging into Smart 1 and 2 ditches Flows conveyed eastward in the Smart 1 ditch are used to maintain water storage in the D Series pond located south of Woman Creek. A headgate on Smart 1 ditch allows irrigation flows to be diverted to Woman Creek Records and information provided by the ditch operator indicate that water is rarely diverted to Woman Creek from Smart 1 ditch South Boulder Diversion Canal (SBDC) flows across the Woman Creek watershed from north to south in an elevated un lined earthen ditch At the crossing with Woman Creek. the SBDC flows are carried over the creek in a metal flume Leakage does occur from this flume with the SBDC contributing minor amounts of water to the drainage Coal Creek is a natural drainageway flowing northeast past the western edge of the Woman Creek watershed. At this point the contributing watershed area of Coal Creek is approximately 15 1 square miles

<u>South Interceptor Ditch</u> The SID collects runoff from the southern industrial area and diverts it eastward to Pond C 2 (Figure 5 18) The Pond C 2 water is not discharged to Woman Creek but is pumped to the Broomfield Diversion Ditch (around Great Western Reservoir) approximately semi annually (DOE 1992a)

The SID was constructed in 1980 to intercept surface runoff that previously entered Woman Creek Since construction of the SID in 1980 Woman Creek has not received runoff directly from the southern part of the plant facility Surface water flow in the SID is intermittent and usually occurs only following precipitation events or snowmelt When flow is low water tends to pond in several low areas of the ditch The SID begins approximately 200 feet east of the Ash Pits (IHSS 133) and extends for almost two miles to Pond C 2 passing through the Original Landfill (IHSS 115) The SID is approximately four to eight feet in depth and is unlined

<u>Areas of Concern</u> For HHRAs conducted at the Site on site exposures will be evaluated in separate AOCs identified in the operable unit AOCs are defined as one or several contaminant source areas that are in close proximity and can be evaluated as a unit in the HHRA A detailed description of the AOCs and the associated IHSSs in OU 5 are presented in TM12 (DOE 1995b)

Three AOCs have been identified in OU 5 (Figure 5 18) and are identified as

- AOC No 1 The landfill area is located north of Woman Creek, and the SID passes through the lower part
- AOC No 2 The ash pits are located north of Woman Creek, and the SID begins east of this AOC
- AOC No 3 Contains the SID Woman Creek, and Ponds C 1 and C 2

### 5 3 2 4 General Design

The surface water model will contribute to the overall HHRA effort by simulating the fate and transport of COCs along several exposure pathways The profile of surface water pathways (Figure 5 2) illustrates the numerous potential mechanisms for human exposures Storm water runoff may transport contaminated soils to surface waters through erosion with subsequent transport to downstream receptors (DOE 1994b)

The Woman Creek streamflow can be attributed to storm runoff from both rainfall and snowmelt, groundwater inflow and inflows originating from irrigation ditches Each of these sources has been included in the flow and transport model

Surface water and sediment associated chemicals can be transported from sources located within the watershed from groundwater inflows or from sediments located along the stream and reservoir bottoms These chemicals are then transported during baseflow or highflow runoff events in Woman Creek. Dissolved chemicals can be transported in the water and sediment associated chemicals can be transported with the sediment moved along the stream reaches

### 5 3 2 5 Fate-and-Transport Model

Selection of Model Codes The surface water modeling of the Woman Creek watershed was done using the Hydrologic Simulation Program Fortran Version 10 (HSPF10) (Bicknell and others 1993) The ANNIE program (Lumb and others 1990) was used to manipulate meteorological and other types of data for input into the HSPF10 computer model

The HSPF10 model was selected due to its flexibility and ability to be expanded to meet future project demands HSPF10 permits simulation of branching one dimensional stream/reservoir systems with groundwater simulation and pond simulation also available The model is capable of simulating water and sediment budgets water temperature dissolved oxygen biochemical oxygen demand (BOD) organic nitrogen ammonia nitrogen nitrate nitrogen organic phosphorus dissolved phosphorus pesticides pH CO total inorganic carbon alkalinity plankton populations arbitrary nonconservative constituents using a first-order decay function and conservative constituents

Verification of Model Codes Verification is the process that demonstrates if the computer program correctly performs its stated mathematical capabilities (Brooks and Coplan 1988) Code verification involves comparing numerical code results with analytical solutions (Cole and others 1988) HSPF10 modules have been verified using empirical formulas and analytical solutions for the various processes being simulated (Crawford and Lindsey 1966 Ambrose and Barnwell 1989)

### 5 3 2 6 Model Capabilities

The HSPF10 computer modeling code is a comprehensive package for simulation of watershed hydrology and water quality Figure 5 19 shows the hydrologic cycle components that are simulated using the HSPF10 model HSPF10 is the only comprehensive modeling code of watershed hydrology and water quality that allows the integrated simulation of land and soil runoff with instream hydraulic and sediment/chemical interactions (Ambrose and Barnwell 1989)

The surface water flow in the model is treated as varying with time (unsteady) The basin geometry is input into the model enabling simulation of real time conditions External variables are input as hourly values and the simulated results are output as daily values

Precipitation and Runoff Hydrologic simulation in HSPF10 is performed using moisture accounting techniques initially developed in the Stanford Watershed Model (Crawford and Lindsey 1966) This technique computes the movement of water into between and out of a set of conceptual storages using a fixed time step Figure 5 20 is a flow chart of the precipitation and runoff processes that are simulated in the HSPF10 surface water code Figure 5 21 is a schematic diagram showing the inter relationships between the precipitation ground storages evapotranspiration surface runoff and streamflow Rainfall and/or snowfall are subject to interception by vegetation If the interception storages are full water infiltrates into the soil layers (if not limited by the upper zone storage capacity) Water that does not infiltrate the upper zone exits the system as surface or interflow outflows Water that infiltrates the upper zone storage and subsurface can then be routed into and/or through the upper lower and active groundwater storage layers based on the available capacities of those storage layers If all these storage capacities are exceeded water leaves the system as active groundwater outflow Evapotranspiration is calculated for all of the above storage layers before capacity exceedance is calculated

Soil Erosion and Sediment Transport Soil erosion from the watershed in HSPF10 is simulated as illustrated in Figure 5 22 Erosion can occur either due to particle detachment from rainfall impact and subsequent washoff or as a result of rill and gully scour Sediment transport along each stream reach is intended to simulate the transport, deposition and scour of inorganic sediment in free flowing stream reaches and mixed reservoirs

Stream and Pond Hydraulics Flow routing is modeled using the catchment stream network technique which is divided into separate calculations for reaches and flow routes that proceed from upstream to downstream The stream network can be of any complexity including flows that are split and later recombined downstream Impoundments (ponds lakes and reservoirs) also are included although HSPF10 assumes such impoundments to be completely mixed that is stratification is not modeled The site reservoir modeled in this study Pond C 1 has been determined to be fully mixed based on its depth and turnover ratio (Appendix A)

Contaminant Fate and Transport Several important mechanisms affect the chemicals being modeled including partitioning between dissolved and particulate phases interactions between chemicals in the water column and the sediment bed and any of a number of chemical specific decay flux processes such as volatilization biodegradation and oxidation Figure 5 23 is a flow chart of the pollutant fate processes that are simulated in the HSPF10 surface water model

#### 5 3 2 7 Model Structure

This surface water model includes the Woman Creek segments and contributing watershed beginning at the upper end of the watershed extending east to Indiana Street (Figure 5 24) The model uses both pervious land modules and stream reach/reservoir modules to simulate the total Woman Creek surface water system The regional model may be expanded in the future to include Woman Creek segments downstream of Indiana Street and/or other watersheds for investigations other than the OU 5 RFI/RI

Six pervious land basins and five stream and/or reservoir segments or reaches were used to model the Woman Creek watershed (Figure 5 24) Table 5 14 describes the geometric properties of the basins and stream/reservoir reaches used in the HSPF10 model Beginning at the upstream end of the watershed and moving eastward reach 1 extends east to the South Boulder Diversion Canal Reach 2 extends to the west boundary of the Site at surface water monitoring sites GS05 and GS06 Reach 3 extends to the confluence of Woman Creek with Antelope Spring Creek. Reach 4 extends to GS17 (upstream of Pond C 1) Reach 5 extends to the outlet of Pond C 1 at GS07 and reach 6 extends to Indiana Street at GS01 and GS02

The stream reaches and contributing pervious land basins were set up to allow calibration of the water balance portion of the model at the gaging station sites located at the downstream end of each stream reach These were also used for the calibration of the sediment transport portion of the model based on sediment deposition into Pond C 1

### 5 3 2 8 Climatological Conditions

The following hourly climatological data are needed for the HSPF10 modeling application

- total precipitation depth
- mean air temperature
- mean dewpoint temperature
- mean wind speed
- total solar radiation
- mean evaporation rates and
- potential evapotranspiration rates

For this modeling application use these specified daily records for the period from July 1989 through April 1994 have been compiled into daily values (Appendix A) All data, with the exception of the evaporation and evapotranspiration rates were recorded at the Site west buffer zone meteorological station (W MetSta) The basic data were recorded in 15 minute increments using an automated meteorological recording system This system consists of individual recording devices that relay the data to a data logger which has a one way telemetry link to a computer database located on the site

The data obtained from the W MetSta had the date time and all six meteorological parameters on a single line delimited by commas These data were reformatted through the creation of a separate computer code in order to format the data for input into the Watershed Data Management (WDM) file The comma delimited file was first converted to a space-delimited format The six parameter space-delimited 15 minute interval file was then converted to six separate space delimited 15 minute interval files with a format compatible with the WDM input requirements

Upon entering the files into the WDM it was discovered that significant data were missing and that much of the data were out of range Therefore the files were then manually edited by inserting missing data with appropriate data from a similar adjacent time period The out-of range data were revised as required

Precipitation The basic data for precipitation were recorded as total accumulated depth in inches over a 15 minute interval These raw data were aggregated into an hourly time series sequence for use as input into the HSPF10 computer program These data were then plotted in order to check for missing and out of range values Missing data were manually added based on the data available from the tables of daily precipitation values obtained from the W MetSta for the NPDES Stormwater Discharge Permit Application report (ASI 1993) The hourly values were further aggregated to daily values and tables were generated for the daily precipitation values (Appendix A) Table 5 15 provides a summary of monthly and annual precipitation at the Site from 1971 through 1994

Air Temperature The basic data for air temperature were recorded as the mean temperature in degrees celsius over each 15 minute interval These raw data were converted to degrees fahrenheit and aggregated into a mean hourly time series sequence for use as input into the HSPF10 computer program. These data were then plotted in order to check for missing and out-of range values Missing data were manually inserted by copying data from an adjacent day and corresponding time period Out-of range data were determined to be air temperatures that are higher than 122 degrees fahrenheit or less than minus 58 degrees fahrenheit No out-of range data were found All adjusted data were checked for reasonableness The mean hourly values were aggregated to maximum and minimum daily values and tables were generated showing daily maximum and minimum air temperatures (Appendix A)

Dew Point Temperature The basic data for dew point temperature were recorded as the average dew point temperature in degrees celsius over each 15 minute interval These raw data were converted to degrees fahrenheit and aggregated into a mean hourly time series sequence for use as input into the HSPF10 computer program These data were then plotted in order to check for missing and out-of range values Missing data were manually inserted by copying data from an adjacent day and corresponding time period Out-of range data were determined to be dew point temperatures that are higher than the corresponding air temperature or less than minus 58 degrees fahrenheit. These values were edited to be equal or slightly less than the air temperature All adjusted data were checked for reasonableness The mean hourly values have been further aggregated to maximum and minimum daily values and tables have been generated showing daily maximum and minimum dew point temperatures (Appendix A)

Wind Speed The basic data for windspeed were recorded as the average horizontal wind speed in meters per second over each 15 minute interval These raw data were converted to miles per hour (mph) and aggregated into a mean hourly time series sequence for use as input into the HSPF10 computer program These data then were plotted in order to check for missing and out-of range values Missing data were manually inserted by copying data from an adjacent day and corresponding time period Out-of range data were determined to be mean one hour wind speeds higher than 75 mph No out-of range data were found All adjusted data were checked for reasonableness The mean hourly values were further aggregated to mean daily values and tables were generated showing the daily mean of wind speeds (Appendix A)

Solar Radiation The basic data for solar radiation were recorded as the average solar radiation in watts per square meter over each 15 minute interval These raw data were converted to langleys per hour and aggregated into a mean one hour interval time series sequence for use as input into the HSPF10 computer program These data were then plotted in order to check for missing and out-of range values Missing data were manually inserted by copying data from an adjacent day and corresponding time period Out-of range data were determined to be a mean hourly solar radiation rate higher than 1000 watts per hour The out-of range data were examined found to be reasonable and left unchanged All adjusted data were checked for reasonableness The mean hourly values were aggregated to mean daily values and tables were generated showing the daily mean for solar radiation rates (Appendix A)

Evaporation The monthly mean data for evaporation rates were calculated by Andis Berzins (EG&G ER/SWD pers commun August 20 1993) based on observed data from the Great Western Reservoir located approximately one mile northeast of the Woman Creek drainage basin These data were provided in inches per hour for each one month interval between October 1991 and September 1992 These mean monthly values were disaggregated into mean hourly evaporation rates for use in the HSPF10 computer program Summary tables have been generated showing the daily mean rates of evaporation (Appendix A)

Potential Evapotranspiration Because data for potential evapotranspiration were not available from the MetSta, the required mean hourly time series sequence were developed using the available meteorological data as input to the code (Kiusalaas and Kunkel 1993) The input parameters were air and dew point temperature solar radiation and wind speed These parameters were downloaded from the WDM as four three year one hour time series and then each time series was divided into three one year time series The four variables were then combined into one time series for each of the three years and reformatted to become the input data. The three resultant one hour time series of evapotranspiration were reformatted then combined into a single three year long time series and input into the WDM Summary tables have been generated showing the daily mean rates of evapotranspiration (Appendix A)

#### 5 3 2 9 External Inflows

It has been determined that lateral inflows of groundwater are entering the Woman Creek watershed from sources that located outside the watershed boundaries (EG&G 1995c) Based on inspections of topographic maps (USGS 1971 1979 and 1980) it was determined that the Rocky Flats Lake SBDC and Coal Creek (Figure 5 24) which are all located upgradient of Woman Creek can contribute water to the alluvium This contributory water later appears as surface water runoff in Woman Creek.

A time series plot of surface flows was developed from gain/loss flow measurements at Station 13 located on Antelope Spring Creek immediately upstream of its confluence with Woman Creek (Fedors and Warner 1993) Monthly flow rate measurements taken January through December during 1992 and 1993 were averaged and the results plotted (Figure 5 25) A time series sequence of mean daily values was developed by interpolating between the monthly values The annual recorded precipitation in 1992 was 13 7 in and in 1993 was 11 7 in slightly less than the median value of 13 9 inches between 1971 and 1994 (Table 5 25) This precipitation time series sequence was duplicated and used to represent all years used during both the model calibration and the 30 year simulation period The Antelope Spring Creek time series sequence was added to Basin 4 as surface inflow

Hydrographs of the water levels in wells 1989 (Antelope Springs Creek) 2689 (Woman Creek) and 5386 (South Woman Creek) (Figure 5 26) and the surface level of Rocky Flats Lake (Figure 5 27) were developed and the seasonal trends were found to be similar This would indicate that the inflow of groundwater is relatively uniform throughout the upper part of the Woman Creek watershed near the western boundary of the Site Therefore the Antelope Spring Creek time series sequence was added to Basins 2 and 3 as a source of lateral inflow of groundwater

The SBDC passes through the upper part of Basin 2 delivering water from Gross Reservoir located north and west of the Site to Arvada Reservoir located south of the Site The headgate records indicate the time periods that the ditch is carrying flow and the dry periods No stage or flow data were obtained. These records were obtained from the Denver Water Board (DWB 1995) The exfiltration rate from the ditch to the groundwater was determined to be 0 06 in/hr during the periods with flow and zero when the ditch was dry This time series sequence was added to Basin 2 to represent a source of lateral inflow of groundwater

The uppermost part of the Woman Creek watershed extends approximately 1 6 miles west of Highway 93 (Figure 5 24) to the foothills at the point where Coal Creek flows into the plains area. The stream gage records for Coal Creek (Coal Creek near Plainview No 06730300) were obtained from the Colorado Water Resources Division on November 15 1994 for water years (WY) 1986 to 1993 These data were used to develop an average annual time series sequence to be used for all of the future simulation years as representative of lateral groundwater inflow into Basin 1 Figure 5 28 shows the 1986 to 1993 average mean daily discharge for Coal Creek at the Plainview gaging station

#### 5 3 2 10 Soils

One of the most important factors that influences the sediment transport processes is surface soil grain size Grain size analyses were performed by Colorado State University (CSU) on 115 surface soil samples collected from OU 2 OU 5 and OU 6 during the Phase II OU 2 RFI/RI (EG&G 1995c) Results indicate that 49 percent of grains from the samples have diameters greater than 100 microns (µm) 22 percent of grain sizes are between 10 and 100 µm and 30 percent of grain sizes are less than 10 µm

In the Unified Soil Classification System particles smaller than 74 µm are considered to be fines (silt or clay) Thus a high percentage of surface soils in the area are fine grained soils Fine grained surface soils are more easily transported by runoff than are coarser grained soils The high percentage of clay also provides a larger surface to volume ratio which allows more adsorption sites per volume of soil than does a coarser grained soil The higher capacity for adsorbed contaminants results in a higher potential for contaminant migration

### 5 3 2 11 Chemicals of Concern

PCOCs are those metals or radionuclides whose concentrations exceed a statistical screening above background concentrations and VOCs whose concentrations exceed the reported detection limits The COCs used in this OU 5 surface water model have been identified in TM11 (DOE 1995a) These COCs can be found in one or more media, such as surficial soils groundwater surface water pond sediments and stream sediments For the purposes of the HSPF10 model the COCs found in surface water and stream/pond sediments have been modeled

A total of 11 COCs have been identified for inclusion in the HSPF10 fate and transport model (Table 5 16) These chemicals have been grouped into four different sets of three (or two) based on their general geochemical behavior and the media in which they are found

Surface Water COCs Six of the eleven COCs were detected in the surface water sampled in Woman Creek These chemicals are listed below

- Barium
- Lithium
- Strontium
- Americium 241
- Uranium 233/234
- Uranium 238

Barium lithium and strontium are COCs for surface water only These elements are also alkaline or alkaline earth metals with similar geochemical behavior Therefore these COCs have been grouped together as Group 1 for calibration and HSPF10 simulation purposes The remaining COCs in the list are found in several media, as shown in Table 5 16

Sediment COCs Eight of the eleven COCs were detected in the pond and stream sediments sampled in Pond C 1 and Woman Creek, respectively These chemicals are listed below

- Copper
- Mercury
- Zinc
- Americium 241
- Plutonium 239/240
- Uranium 233/234
- Uranium 235
- Uranium 238

Copper mercury and zinc are all metals that are found in Woman Creek stream sediments (mercury and zinc are also found in Pond C 1 sediments) These three COCs have been grouped together as Group 2 for calibration and HSPF10 simulation purposes Americium 241 and plutonium 239/240 both of which are radionuclides are found in pond and stream sediments and have been included in Group 3 Uranium 233/234 uranium 235 and uranium 238 are radionuclides that are found in Pond C 1 sediments and have been included together in Group 4

Source Terms Source term concentrations were calculated for both the calibration and simulation of the COC concentrations in surface water Table 5 16 provides a listing of the COCs and indicates the media in which the chemical has been detected For the model calibration the COCs associated with surficial soils were used as source term data. Groundwater inflow concentrations were checked and it was found that groundwater did not appear to be contributing surface water COCs to the flow regime In order for the data to be used as a calibration source term value the following criteria must be satisfied

- Source term media must be located upstream of the COC media (observed target data)
- The source term data must have originated within an AOC
- The data must have been collected as part of the OU 5 FSP

Each source term value was calculated as a mean concentration of a COC within the associated sub basin The Thiessen polygon method was used to determine the area of influence for each sampling location within the AOC The remainder of the watershed was assumed to have a zero concentration of each COC An area weighted concentration for each COC located in each watershed sub-basin was calculated for input into both the calibration and simulation models

For the purposes of the HSPF10 model calibration the source terms were calculated with the assumption that the SID was in place and functional Therefore in the landfill (AOC 1) only the COCs located south of the SID were included in the calculations Conversely in the ash pits (AOC 2) and in Woman Creek and Pond C 1 (AOC 3) all the observed COC concentration data were used in the computation of source terms contributing to the observed concentrations found in Woman Creek and Pond C 1

For the purposes of the HSPF10 future concentration model simulation the source terms were calculated assuming the SID had been abandoned The COC concentrations north of the SID within the landfill area (AOC 1) were included in the composite source term calculations This assumption will permit surface runoff and any associated contaminants to drain south into Woman Creek during the 30-year simulation runs

#### 5 3 2 12 HSPF10 Model Calibration

Calibration of the HSPF10 computer model is required before the model can be reliably used for simulation purposes The model was calibrated to past observed conditions for which six months of continuous data were available The following sections describe the targets procedures and results of the model calibration process

Calibration Targets Three documented hydrologically dependent conditions were calibrated

- Water budget
- Sediment transport
- Concentrations of COCs

These conditions were modeled in individual modules and each process was calibrated in the above listed sequence in order to systematically calibrate the entire model

*Water Budget Calibration Targets* The observed hydrograph data and the associated rating curve equations for gage station GS01 GS02 GS05 GS06 GS07 and GS17 were obtained from EG&G SWD Table 5 17 lists each gage station its general location the type of flow recording device in place and the rating equation for depth versus flow The data were plotted and reviewed for reasonableness Each gage station was found to have missing and erroneous data at various times throughout the stream gaging periods Based on the reliable data available the watershed mass balance and hydrograph shapes were calibrated for the period beginning on April 9 1993 and ending on September 26 1993

A field investigation revealed that the corrugated metal culvert carrying Woman Creek flows under Indiana Street (GS01) had a high point in the middle resulting in 0 29 feet of ponded water upstream of the invert of the culvert The rating curve was analyzed and found to be accurate for stages of two feet or more and incorrect for stages less than two feet.

Therefore the hydrograph data obtained for GS01 had to be adjusted using a 0 29 foot stage shift and a revised rating curve No associated stage data were available because the flows were adjusted by EG&G without corresponding stage adjustments Therefore the stage for each associated flow had to be determined mathematically from the rating-curve equation (EG&G 1994d) A polynomial equation was developed for the existing rating curve data. By substituting the flow value into the equation, the corresponding stage was determined That stage was then decreased by 0 29 feet and all negative stage values were set to zero A new rating curve was developed and a polynomial equation was developed for that rating curve The revised hydrograph values were obtained mathematically using the revised stage values in the new rating-curve equation The resultant hydrograph values are approximately half of the previous values

The rating curve for GS02 was analyzed and found to be inaccurate for low stages The same procedure used for GS01 was used to revise the GS02 rating curve The revised hydrograph for GS02 was combined with GS01 and used as the target for calibration of Woman Creek. The remaining gage station data were reviewed and found to be reliable for use in calibrating the water balance portion of the HSPF10 model

*Sediment Transport Calibration Targets* Empirical data for total suspended sediment (TSS) (Table 5 18) along Woman Creek and for the total accumulation of pond bottom sediments within Pond C 1 were chosen as calibration targets for the sediment transport portion of the HSPF10 model Data used for calibration included TSS values measured during the OU 5 field sampling phase of the Phase I RFI/RI and TSS values measured in high flow samples collected during other Site programs (EG&G 1994e) The calibration time period was expanded from the six months used for water mass balance to seven years for the sediment transportation Three pond bottom sediment core samples were taken on November 5 1992 two of which had core depths of six inches and one that had core depths between 6 and 12 inches The average accumulated sediment in the bottom of Pond C 1 since the pond was constructed in 1973 was estimated to be 8 to 10 inches Therefore over the twenty year period that Pond C 1 has been in operation the average sediment accumulation was calculated to be approximately 0 4 inches per year or roughly three inches in a seven year period

*Water Qualitv Calibration Targets* Table 5 16 provides a listing of the COCs and indicates the media in which the chemical has been detected For the model calibration the concentrations of COCs associated with both surface water and stream/pond sediments were used as observed target data. Each target concentration was calculated as a mean concentration of a COC within the associated watershed sub basin To determine the area of influence for each sampling location along Woman Creek (AOC 3) an average stream width of five feet was used and the stream length was measured from topographic maps An area weighted concentration for each COC located in each watershed sub-basin was calculated for input into both the calibration and simulation models For the three pond bottom sediment samples the arithmetic average of the observed concentrations was calculated for use as the observed target values

<u>Calibration Procedure</u> A surface water flow and transport model is generally calibrated by adjusting a set of model parameters to produce simulated flows TSS concentrations and chemical concentrations that match field measured values within a quantifiable range of error or within reasonable limits There are basically two ways of adjusting model parameters to achieve calibration

1 manual trial and error adjustment, and

2 automated parameter estimation

Calibration of the HSPF10 computer model for the Woman Creek drainage basin was achieved using the manual trial and error method

*Water Budget Calibration Procedure* The flow module was calibrated by isolating each of the six sub basins and achieving a mass balance within each sub basin while using the observed hydrograph data from the upstream basins as inflow and the observed hydrograph data at the outflow point as the calibration target After the individual sub basins were calibrated the model was restructured allowing the simulated outflow of each upstream basin to be the inflow to the adjoining downstream basin

Two methods were used for comparing observed data to simulated flow rates and mass volumes

1 Quantitative comparisons The simulated mean daily flows and observed flows were each summed to obtain the total simulated and observed mass volume at each calibration location for the six month period (April to September 1993) The percent differences between the observed and simulated results were then calculated for each location
2 Qualitative comparisons The time series sequences of observed and simulated hydrograph data were plotted and the results were compared to determine the similarities or differences in the data Specifically the magnitude and temporal location of the hydrograph peaks were compared

The simulated hydrograph shape and peak flow rate were adjusted only after the simulated mass balance was found to be within 25 percent of observed values

*Sediment Transport Calibration Procedure* After the flow models were calibrated and integrated into a single model the sediment calibration was performed The first sediment calibration procedure was to approximate the estimated three inches of sediment accumulation to have occurred in Pond C 1 during the last seven years The seven year time frame was chosen based on the greatest length of site specific continuous meteorological data that was available without significant data gaps It is imperative to obtain the greatest length of time available because the bulk of sediment can accumluate during a very few widely separated high intensity precipitation events It is also important to use site specific data when available

The seven year time period covers the dates of January 1 1986 through December 31 1992 Data for 1993 were not included because a full year of data was not available at time of calibration Full years only were used in the sediment calibration because the sediment transport is seasonally dependent, and estimation errors are likely to occur when extrapolating incomplete years to a complete year Furthermore the start and end dates of the year should occur during a relatively inactive period i e when little or no rainfall occurs

Simulated sediment accumulation in Pond C 1 was compared against the sediment target and sediment transport parameters were adjusted to bring the simulated sediment budget within 10 percent of the target sediment budget. The significant parameters used to calibrate the sediment processes for the pervious land basins are

- soil detachment by precipitation
- soil scour due to precipitation and
- soil washoff due to precipitation

The significant parameters used to calibrate the sediment processes for the stream reaches are

- settling velocity of the sediment particles
- critical shear stress of particles for resuspension of bed sediments and
- critical deposition stress for deposition of suspended sediments

After the sediment accumulation approximated the target accumulation the frequency and magnitude of the sediment transport was calibrated The time frame chosen for this portion of the calibration was the same as the flow calibration May to September 1993 This period encompasses the only three sampling events when TSS in Woman Creek was measured during high flow events The observed TSS values in stream reaches 2 3 and 4 were used as the calibration target values The TSS values in stream reach 6 (downstream of Pond C 1) have been influenced by the detention effects by Pond C 1 and therefore reach 6 was not considered in the sediment calibration

The parameters used to adjust the frequency and magnitude of the simulated TSS in the Woman Creek stream reaches are the same as those used in the accumulation calibration TSS calibration involves adjusting HSPF10 model sediment parameter values until the simulated TSS concentrations for both relatively small and large storm events adequately approximate the observed TSS concentrations on target dates This procedure is based on the fact that the sediment source of the TSS in a stream reach will vary based upon the size and intensity of the storm event That is small storm events have a tendency to generate TSS by scouring the stream bed while receiving little washoff from the pervious land basins Conversely during larger storm events contributions from pervious land basins to TSS increase significantly Therefore the ratio of sediment load from the basins to the sediment scoured from the reaches was adjusted until the proper sediment magnitude and frequency were reached The two calibrations methods discussed in this section were then iteratively repeated until both sediment calibration targets were satisfied

*Water Quality Calibration Procedure* The water quality calibration of the OU 5 surface water model was accomplished using two distinct methods These calibration methods are analogous to the methods used in the sediment model calibration where the calibration target values were total sediment accumulation in Pond C 1 and point TSS values as measured in the water column This relationship is explicit because the COCs are considered to be closely associated with sediments In the case of fate and transport of constituents the calibration targets are

- Concentration values of bed sediment associated constituents in Pond C 1 accumulated since source placement and
- The average values of the suspended sediment associated and dissolved constituents in the stream reaches

The first calibration method involves simulating the fate and transport of a constituent from an upgradient source area to a downgradient depositional area, where the resulting depth and concentration of the constituent are known This method is useful for the initial calibration of the fate and transport parameters for the model and for a gross characterization of the system The second method involves fine tuning the water-quality calibration parameters in order to simulate the actual water-quality concentrations as closely as possible

The actual accumulation calibration was performed by simulating the deposition of the COCs currently present in AOC 3 by using AOCs 1 and 2 as the constituent sources Water-quality fate and transport parameters were adjusted until the concentrations simulated for AOC 3 reasonably matched the existing concentrations present in AOC 3 as determined by field sampling The following assumptions are inherent in the calibration

- Any COCs currently present in AOC 3 are the result of transport from AOC 1 and 2 and are not attributable to any other source term
- The length of time from source placement to sampling date of the calibration target can be reasonably estimated
- The model input and boundary conditions used for the simulations represent the actual conditions present during the time from source placement to measurement date and
- The source term is constant and not depleted

The water quality calibration was performed on both a 7 3/4 year and 30 year time frame The 7 3/4 year time frame selected was the same period used in the sediment transport calibration with the meteorological data extended three quarters of a year to include dates when storm-event TSS measurements were taken for OU 5 The period January 1 1986 to September 30 1993 was the primary calibration period because the data are site specific to the Site

Thirty year meteorological data sets generated for use when running simulations for the HHRA and discussed in Section 5 3 2 13 1 were also used during the water quality calibration as a qualitative calibration check It was determined the 30 year sets could function in this capacity because source placement is thought to have occurred between 43 years and 20 years ago It is fairly certain no source existed prior to the opening of Rocky Flats Plant in 1952

It is also assumed that a significant amount of the source term material was in place 20 years ago This is the estimated point in time at which the Original landfill and incinerator had been operating for approximately 20 years Using 30 years as the source placement time frame yields a 70 percent to 150 percent uncertainty of the source initiation This range is well within the criteria required for a qualitative calibration check

The simulated concentrations in Pond C 1 were compared against the bed sediment concentration targets when calibrating with the 7 3/4 year set and the water-quality and sediment transport parameter values were adjusted to bring the simulated concentrations to within 25 percent of the target concentrations The 7 3/4 year simulation period is roughly 25 percent of the 30 year source term placement time period The significant parameter used in calibrating the quality processes are the adsorption/desorption rates of the constituents Other parameter values such as partition coefficients ($K_d$) (Table 5 19) or quantity of constituent associated with transported sediment are either calculations field measurements or literature values

It is assumed all the COCs modeled are sediment associated although they may exist in the dissolved state during water quality processes That is hydrolysis oxidation first-order decay biodegradation etc are not considered relevant for the OU 5 COCs

Once the simulated bed concentrations approximated the observed results the suspended sediment water quality concentrations and dissolved water quality concentrations were calibrated Because adsorption/desorption was the only water quality parameter used in the calibration, the adjustment of simulated dissolved concentrations directly affects the bed associated concentrations (i e increasing the water column concentrations will decrease the bed concentrations) The calibration of the dissolved constituents was performed to further define the ratio of pervious land sediment washoff to sediment scour from the stream reaches For example using a high desorption value for a constituent results in much of the transported constituent leaving the OU 5 system in the dissolved flow This fate then requires the transport of greater amounts of sediment from the source areas to achieve the target concentration in the bed sediments of Pond C 1 If during the iteration between adsorbed and dissolved concentration calibrations a realistic simulation of both concentrations could not be obtained, it was necessary to return to the sediment calibration to adjust the pervious land washoff (constituent source) and stream scour (clean sediments) ratio In this manner the calibration loop for the bed concentration water-column concentration sediment accumulation and TSS was iteratively performed until all three calibrations were satisfied

After calibration was completed the model was run using the 30 year meteorological data sets as a qualitative check High intensity precipitation events were investigated to determine if the resulting maximum water quality concentrations are reasonable and if the means/medians of the 30 year data sets approximate the measured values

<u>Calibration Results</u> The results of the HSPF10 model calibration for the water budget sediment transport and water quality modules are presented in this section The individual modules have been calibrated to achieve the best correlation to observed data for that module while balancing the calibration results of the other two modules within as narrow a range as possible

*Water Budget Calibration Results* Figures 5 29a through d show the calibration hydrographs at each of the gage stations along the mainstream of Woman Creek The individual hydrographs of the simulation runs and observed gage station flow data were quantitatively and qualitatively compared

The quantitative results for each sub basin analyzed have been shown in the respective figures and tabulated in Table 5 20 The comparison of the total observed and simulated mass volumes indicates that the model under simulates the volume by 25 percent at GS05 and over simulates the volumes by 22 percent at GS02 The under simulation of volumes at GS05 reflects the approximately 250 000 cubic feet of observed flows during the May 15 to May 26 1993 time period which are considered to be over estimated due to instrument error The overall mass balance is considered satisfactory

The temporal spacing of the simulated storm peaks compares favorably with the observed storm peaks However for the April 13 1993 storm event the magnitudes of the peak flows are under simulated whereas the peak flows for storms during the time period from June 20 to September 15 1993 are over simulated

*Sediment Transport Calibration Results* The calibration results for the 7 year bottom sediment accumulation for Pond C 1 are summarized in Figure 5 30 The simulated depth of 0 25 feet represents 100 percent of the target accumulation goal of 0 25 feet, as discussed in Section 5 3 2 12 Sediment Transport Calibration Targets of this document

It was not possible to precisely calibrate to a specific target value because the range of sediment accumulation in Pond C 1 has been estimated at 0 66 to 1 0 feet Any calibration within the calculated target range could be considered valid Therefore the final calibration value was determined when the sediment module was modified to be calibrated to observed TSS values

Observed and calibrated TSS values for reaches 2 3 and 4 of Woman Creek are shown in Figures 5 31A through 5 31C The average values for the reaches were also calculated because measured TSS values are highly variable and dependent upon location of the sampling site Therefore an average daily TSS value for all of the stream segments combined was considered in the calibration The average observed and simulated TSS values for Woman Creek stream reaches are presented in Figure 5 31D The average TSS values were used to objectively finalize the sediment calibration parameters When each reach was individually calibrated there still existed some latitude in determining the final calibration parameters for the system as a whole At this point the sediment calibration parameters were adjusted to best match the average observed TSS without significantly affecting the individual reach calibrations

Reaches 5 and 6 of the model were not directly calibrated to observed values Pond C 1 (reach 5) was not sampled for TSS during storm event sampling Because storm-event TSS values are the primary calibration criteria, this reach was limited to a qualitative comparison of estimated baseflow TSS values Similarly the four sampling locations that are situated in reach 6 were not sampled during storm events and therefore can not be reliably used for sediment calibration

This lack of observed TSS data for reaches 5 and 6 however is not critical to the calibration of the sediment model Pond C 1 is highly efficient in functioning as a sediment trap and is not expected to discharge any significant amount of suspended sediment Also because reaches 2 3 and 4 were calibrated using the same sediment calibration parameters (as opposed to using different initial and/or boundary values for each reach) reach 6 was calibrated using the same sediment calibration parameters

The final simulated TSS peaks shown in Figure 5 31 are somewhat lesser in magnitude than in the original TSS calibration because the sediment calibration is ultimately dependent upon the water quality calibration This adjustment was required to adequately calibrate the simulated COC water quality concentrations The calibration is considered within the range expected of sediment transport models

*Water Quality Calibration Results* Water-quality calibration was performed for data collected over seven years the results are depicted graphically on Figure 5 32 Additionally qualitative checks were performed to scrutinize the model s response to large precipitation events This check was accomplished by using a few of the 30 year data sets developed for the HHRA simulations as input to the model and obtaining a mean of the predicted concentrations for all COCs

The construction of the SID during the middle of the estimated accumulation period for pond sediments complicates the calibration process It is impossible to quantify the degree of accumulation of COCs in the sediments of Pond C 1 before the SID construction and compare it to the accumulation in the pond after the SID construction The 7 year calibrations that are extrapolated to 30-year estimates were performed with the SID in place for the following reasons

- The observed target values for the water column were measured with the SID in place
- The flow and sediment models were calibrated to the period after construction of the SID and
- Water quality calibration derived while excluding source areas north of the SID produces conservative concentration values

The fate and transport of mercury was not calibrated because the observed source area for mercury is insufficient to produce the required target value in Pond C 1 Because mercury is highly volatile the source area would begin to deplete itself immediately after placement Thus the sampled source area measurements for mercury are considered unreliable for use as a calibration source term

Parameter values for mercury were obtained by using the parameters of calibrated COCs whose behavior during fate and transport processes would best approximate that of mercury Given the COCs investigated in this project, copper or zinc are the most similar in behavior to mercury (EG&G 1995g) Because the copper and zinc were calibrated to identical parameter values these same values were used for mercury during the simulations for the HHRA

The observed COC concentrations along with the results of the 7 year simulation period (with the SID in place) the extrapolated 30 year simulation results (with the SID in place) and the extrapolated 30 year simulation results (without the SID in place) are listed in Tables 5 21 and 5 22 for the four COC groups considered For Group 1 there is no target for the streambed sediment, because these constituents are not COCs for that medium

The results for the 7 year simulation were multiplied by 4 28 to estimate the sediment accumulation for a 30 year period with the SID in place Concentration estimates for a 30 year period without the SID in place were estimated by multiplying the previous results (i e 30 years with the SID) by 1 5 times the quotient of the source concentration north of SID divided by the source concentration south of SID This ratio represents a source area upgradient of the SID that is 1 5 times greater in size than the area downgradient of the SID along with its respective change in COC concentrations

The 7 year with the SID scenario represents the condition with the minimum simulated concentrations and the 30 year without the SID scenario represents the condition with the maximum simulated concentrations The simulated concentrations for the bottom sediment quality were compared to the observed COC concentrations and reported as a percentage of the observed concentration Because the simulated concentrations for each stream reach and each COC group vary greatly a mean of all percentages was determined (see Table 5 22) The mean of these percentages brackets the observed concentrations listed in Table 5 22

The mean water column and sediment associated calibrations are within plus or minus one order of magnitude which is sufficient resolution for the HHRA The mean 7 year simulation of the water-column COC concentrations for individual COCs ranged from 0 3 percent to 48 3 percent, with a mean estimation of 22 8 percent of observed concentrations (see Table 5 21) For streambed associated COCs the mean of the 7 year with the SID and 30 year without the SID simulation ranged from 63 4 percent to 781 8 percent of the observed concentrations (see Table 5 22)

A review of the percent differences between simulated and observed concentrations in the Pond C 1 water column reveals that Group 3 COCs are under simulated by 2 to 3 orders of magnitude The simulated americium 241 and plutonium 239/240 activities in Pond C 1 were not increased for the following reasons

- the adsorption/desorption parameters for Group 3 are set at the lowest possible values thus maximizing accumulation in bed sediments
- the adsorption/desorption parameters for Group 2 metals which are over simulated in bed concentrations are set at their highest effective value thus minimizing simulated bed concentrations and
- sediment accumulation in Pond C 1 is already simulated at the permissible upper range of the estimated sediment target value

An attempt to increase the simulated, bed load activities of americium 241 and plutonium 239/240 would result in unrealistic behavior of the entire simulated sediment/water system, given the three factors listed above

### 5 3 2 13 Fate-and-Transport Modeling

The final task of the OU 5 modeling was to estimate the future concentrations of COCs along Woman Creek in support of HHRA for the OU 5 RFI/RI This involved estimating long term average concentrations of COCs in the stream flow sediment in the Pond C 1 and in Woman Creek at Indiana Street These estimates were based on the results of thirty 30 year simulations This section discusses the generation of thirty 30 year meteorological data series and the results of the 30 HSPF10 simulations

<u>30 Year Time Series</u> The 30 year climate data generated by the CLIGEN model (Nicks 1985) were used as input to the HSPF10 model to simulate the conditions for the last 30 years Though it is not assumed

that any of the 30 year meteorological data sets precisely simulates the conditions of the last 30 years it is assumed the CLIGEN data sets are fairly representative of average 30 year conditions Therefore the maximum minimum and mean values for the simulated concentrations were used to bracket the target concentration values

<u>Source Terms</u> Source terms for the 30 year simulation runs were calculated for the simulation of the COC concentrations in the water column The source terms in the model calibration were used with some modifications for the simulation runs Specifically COC concentrations in sediment sampled from the SID were used as a source term for sediments and water flowing into Woman Creek. Also COC concentrations in surficial soils of the original landfill which is located north of the SID in AOC 1 were included in the chemical loading for basin washoff that may enter Woman Creek during a storm event.

<u>Simulation Results</u> Simulation and result summaries for both the water column (dissolved) and sediment associated (total) fractions of the eleven COCs in surface water media are provided in Tables 5 23 through 5 26 In addition mean daily concentrations have been determined at the downstream end of four stream reaches along Woman Creek, as follows

- Reach 3 confluence with Antelope Spring Creek
- Reach 4 approximately 400 ft upstream of Pond C 1
- Reach 5 Pond C 1
- Reach 6 Indiana Street (east boundary of the Site)

The results of these statistical summaries are shown in Tables 5 23 through 5 26 for COC groups 1 through 4 respectively and have been used as input for the HHRA

In order to condense the simulated mean daily concentrations produced from the four groups of thirty 30 year computer runs (120 computer runs) to a series of values more easily used in the HHRA the daily means were statistically summarized The first step involved condensing the data in each of the thirty 30 year simulations for each COC group to 30 mean daily concentrations resulting in 30 mean daily concentrations for each of the 11 COCs These 30 mean daily concentrations were then statistically summarized to produce a final mean daily concentration for each COC

### 5 3 3 Air Modeling

#### 5 3 3 1 Air Modeling Objectives

Wind suspension of potentially contaminated soil from the IHSSs within OU 5 to downwind receptors has been identified as the mechanism for several exposure pathways Human exposure could occur by inhalation ingestion or dermal contact of this airborne contaminated particulate matter Receptor populations are current and future on site workers future onsite ecological researchers and open space users The air pathways for these receptors have been designated as potentially complete although relatively insignificant and have been selected for quantitative risk assessment (DOE 1995b)

The purpose of the air dispersion modeling is to estimate COC concentrations and deposition rates at the potential receptor locations of interest These specific point exposure concentration and deposition values will provide input to the risk calculations of the HHRA

#### 5 3 3 2 Selection of Air Models

The air dispersion model selected for the OU 5 HHRA is the Fugitive Dust Model (FDM) (Winges 1991) Development of the FDM has been sponsored by EPA Region X to address the concentration and deposition of particulate matter from fugitive dust sources The FDM is described fully in TM13 (DOE 1994b) as well as in the source document (Winges 1991)

#### 5 3 3 3 Wind Resuspension Potential Study Objectives

Air dispersion modeling provides the primary basis for assessing the inhalation risks posed by windblown, contaminated dust to current and future onsite workers Perhaps the most critical input parameters to air dispersion models are those associated with the source terms In OU 5 the important source input factors are the contaminant levels in the surface soils and the wind resuspension potentials of those soils The original investigations of the OU 5 RFI/RI Work Plan focused on the contaminant levels in the surface soils and those findings are discussed extensively in TM15 The objective of the additional air-quality study was to assess the wind resuspension potential of the soils in the IHSSs in OU 5

In 1993 EG&G Rocky Flats Inc conducted a field investigation throughout OU 3 to determine the wind resuspension potentials of the soils in the areas east of Indiana Street (DOE 1994c) The OU 3 study utilized a portable wind tunnel That study yielded important information about the wind erosion potential of the OU 3 areas possibly the most valuable of which was the calculation of specific threshold friction velocities and threshold wind speeds of the sites that were examined Friction velocity which is a measure of the wind shear at the erodible surface characterizes the capacity of the wind to cause movement of surface particles Threshold friction velocity is the minimum velocity that results in particle movement. Threshold wind speed is equivalent wind speed at a specified elevation above the ground surface for example approximately 30 feet (10 meters) the standard height of a reference anemometer The purpose of the study of wind resuspension potential in the Woman Creek Drainage was to estimate the threshold friction velocities of the OU 5 sites and compare these to the results of the OU 3 wind tunnel study If the OU 5 investigation results compare favorably with the threshold friction velocity values determined in the OU 3 wind tunnel study then the OU 3 data can be utilized reliably for the OU 5 RFI/RI air dispersion modeling and henceforth the HHRA

Methodology for the Study of Wind Resuspension Potential The investigation of the wind resuspension or erosion potential of contaminated soils in areas of interest in OU 5 including IHSS 115 IHSS 133 the surface disturbance south of IHSS 133 IHSS 209 and the surface disturbance west of IHSS 209 was proposed as a phased approach The first phase involved a limited field investigation of the site and comparisons of these results with those of the more intensive wind tunnel study that was performed at OU 3 If the first phase results were inconclusive then a second phase was recommended. The second phase would be the replication at OU 5 of the intensive field studies that were conducted in 1993 at OU 3

The wind resuspension study relied on the rapid assessment methodology described by Cowherd and others (1985) The field examinations consisted of observations about sites selected as representative of the areas of interest in both OU 3 and OU 5 (see Figures 2 5 through 2 7 for observation locations) At each location visual examinations of soil type and conditions and vegetative cover were conducted The soil type was characterized along with the soil moisture and presence or absence of soil crusting The extent of bare soil vegetative cover and other nonerodible elements (gravels and cobbles larger than 1 cm diameter) were estimated Finally a soil sieving procedure was conducted at each location with 4 mm 2 mm 1 mm 0 5 mm and 0 25 mm sieves to estimate the aggregate size mode of the surface soil From the estimate of the aggregate size mode the threshold friction velocity of the soil was determined from a figure in the reference document. A correction factor was calculated to account for the increase in threshold friction velocity due to the nonerodible elements

In working with the rapid assessment method several limitations and difficulties with the procedures and calculations were encountered The reference document (Cowherd and others 1985) cautions that the procedures provide only a first-cut, order of magnitude estimate of exposure in limited applications Nevertheless the Cowherd method is endorsed as affording a degree of accuracy consistent with simplified quantitative estimation procedures (EPA 1988b) Approaches such as the Soil Conservation Service method (Woodruff and Siddoway 1965) to estimate wind erosion apply to annual losses from crop land and cannot be applied to generate short term estimates The Cowherd method was selected because of the current land use of the Site the nature of the soils and vegetative cover in OU 5 and the episodic high wind events characteristic of the region

Certain assumptions incorporated into the rapid assessment method somewhat limited the interpretations of the OU 5 study Most apparent was the utilization of only a few sieve sizes to estimate the mode of the aggregate size Soil elements larger than 1 cm (nonerodible elements) were not included in the sieve analysis At some locations this fraction composed the most volummetric fraction Standard soil sieving techniques quantify the fractions by weight The Cowherd rapid assessment method calls for visual estimates of the relative sizes of the catches Investigators for this study improved the technique by volummetrically measuring the individual fractions to estimate the mode In addition it was difficult to estimate how much of the nonerodible elements were embedded in the ground surface When in doubt 50 percent seemed like a reasonable estimate A serious limitation that was noted by the investigators was the poor quantitative accounting for the mitigating effects of partial vegetative cover Correction factors for nonerodible elements could not be assigned values greater than 10 due to limitations in the graph accompanying the reference document.

<u>Results and Discussion of Wind Resuspension Study</u> Field work was performed from January 20 to January 27 1995 Weather conditions during the month prior to the field study were unusually dry All soils were dry during the study period Ambient temperatures were unseasonably warm in the 40 °F and 50 F ranges Daytime winds during the study period were light from the southeast and east.

The 1993 OU 3 wind tunnel study examined four terrestrial sites These same four terrestrial sites were investigated as part of this study of wind resuspension potential (Figure 2 5) Sites T 1 T 2 and T 3 of the OU 3 wind tunnel study were chosen for that study as representative of the soil and vegetation conditions on areas directly east of the Site Conditions were somewhat different at each site At T 1 the soil was a clayey silt with some fine gravels and vegetative cover was fair to good Location T 3 was three fourths of a mile or more east of T 1 Here the soil was a silty sandy gravel Although the vegetative cover was far less than at T 1 the other nonerodible elements provided a comparable overall coverage Location T 2 displayed a silty sand with fair vegetative cover The fourth terrestrial location T 4 was about two miles southeast of the other three OU 3 wind tunnel study sites It had been selected because it was characteristically different from the other three sites The soil was a silty sand and although the aggregate size mode was comparable to two of the other OU 3 sites the vegetative and other nonerodible cover at this fourth location was minimal

Ten locations in two groups of five each were chosen as representative of soil and vegetation conditions within IHSS 115 (Figure 2 6) Surface slopes throughout the Original Landfill are fairly steep 15 percent to 40 percent and facing south Locations 115AQ1 through 115AQ5 were situated west to east along the top of the landfill slope Soils were gravelly sands with larger aggregate size modes and noticeable bare soil The extent of nonerodible elements both gravels cobbles and vegetation was variable Location 115AQ5 was somewhat down the slope and displayed a smaller aggregate size mode and more vegetative cover The remaining locations in IHSS 115 115AQ6 through 115AQ10 were situated east to west along the lower elevations of the landfill They were characterized generally by smaller aggregate size modes and very good vegetative cover

Within IHSS 133 five locations were examined as representative of conditions in that area of interest (Figure 2 7) Area slopes were gentle approximately five percent with a south orientation Soils were gravelly sands and sandy silts with smaller aggregate size modes Vegetative cover was excellent usually complete

At this writing the three surface disturbance areas on the south side of Woman Creek are not considered areas of contaminant concern and have not included as radiological sources in the air dispersion modeling for the OU 5 RFI/RI Fewer locations within these three areas were examined in this wind resuspension study

The Surface Disturbance South of IHSS 133 is located on a flat hilltop on the south side of Woman Creek Within this area, two locations identified as SASH AQ16 and SASH AQ17 were investigated (Figure 2 8) Soils were gravelly sands indicative of a hilltop situation The aggregate size modes were smaller Vegetative cover was very good

IHSS 209 is a large basically level surface disturbance area on another hilltop on the south side of Woman Creek Three locations identified as 209AQ18 through 209AQ20 within IHSS 209 were examined (Figure 2 9) The soils on this hilltop were generally sandy gravels exhibiting larger aggregate modes Vegetative cover was only fair but other nonerodible elements added conspicuous protection from wind erosion

The Surface Disturbance West of IHSS 209 is a moderately sloping hillside north facing on the south side of Woman Creek. Two locations W209AQ21 and W209AQ22 were examined in this homogeneous area (Figure 2 9) Gravelly and clayey sands characterized the slope Aggregate size modes were smaller Vegetative cover was uniformly very good.

The results of the OU 5 study of wind resuspension potential are summarized in Table 2 11 The rapid assessment method produced values for threshold friction velocities at the four OU 3 wind tunnel study sites that were within the same order of magnitude but higher by several factors as the results of the actual OU 3 wind tunnel study (Table 2 12) Field observations of the vegetative and soil conditions at both the OU 3 wind tunnel study sites and throughout OU 5 found that the two areas generally were comparable Aggregate size modes of soil particles were typically larger throughout OU 5 than in OU 3 The vegetative cover was generally more extensive in OU 5 than in OU 3 excepting the top of the slope at the Original Landfill and IHSS 209

The threshold friction velocities calculated for the OU 5 locations were consistently higher sometimes by an order of magnitude than the values reported in the OU 3 wind tunnel study Consequently the threshold wind speed values from the OU 3 study can be applied to the air-dispersion modeling for the OU 5 RFI/RI and HHRA with the confidence that conservative health protecting assumptions are being exercised

The rapid assessment method yielded values that are conservative estimates of the threshold friction velocities and threshold wind speeds around OU 5 With the availability of the results of the wind tunnel study at OU 3 where field conditions are generally comparable to OU 5 more accurate values are not required at this time for air dispersion modeling

### 5 3 3 4 Conceptual Model for Air Transport of COCs

COCs in surface soils may be transported via emissions of fugitive particulate matter to onsite and offsite exposure points Inhalation of contaminated particulate matter is a potentially complete exposure pathway for current and future outdoor workers ecological researchers and open space users Potential contaminant intake and corresponding risks associated with these media will be evaluated in the HHRA (DOE 1995b)

### 5 3 3 5 Assumptions and Limitations for Air Model

The FDM is based on the well known analytical Gaussian plume formulation that constitutes the basis of almost all atmospheric-dispersion models approved by EPA for regulatory use (Turner 1970 EPA 1986) The FDM incorporates an improved gradient transfer deposition algorithm based on analytical equations of Ermak (1977) for computing concentration and deposition values of fugitive particulate matter at user selected receptors The line source and area algorithms in the FDM are those in the CALINE3 model The CALINE series is also based on the analytical Gaussian equation and is a preferred regulatory model of EPA (EPA 1986)

Assumptions and limitations inherent in the FDM include those common to all air-dispersion models based on the Gaussian plume equation

- The source emission rate is assumed to be constant.
- Diffusion in the direction of transport is assumed to be small compared with advection by wind speed in that direction
- The material diffused is assumed to be a stable gas or aerosol that remains suspended in the air over long periods
- All pollutants are assumed to exhibit perfect reflection from the ground and from an upper inversion surface

- A mean wind speed is assumed to be representative of the diffusing layer chosen
- The mean wind speed direction specifies the x axis
- Wind speed is assumed to be constant and the turbulent fluctuations in the x direction are much greater than in the y or z-directions
- The time averaged concentrations of plume constituents are assumed to be distributed normally in both cross wind and vertical directions
- Values of sigma y and sigma z are representative for a sampling time of about 10 minutes
- Downwind concentration values are limited to receptors with 50 km of the source (Turner 1970)

With the FDM deposition routine these assumptions and limitations apply

- Eddy diffusivities are assumed to be functions only of downwind distance
- Eddy diffusivity is assumed to be constant for all space and time
- Concentration and deposition values are numerically integrated for a large number of cases involving different meteorological conditions different particle sizes and different release heights in the FDM program A numerical solution was developed to correct the concentration values so that approximate mass conservation is obtained for all cases In general for particles smaller than 10 microns the corrections are very small for all cases examined Correction factors are built into the FDM and the use of corrections factors is entirely transparent to the user (Winges 1991)

A number of assumptions relating to the input parameters for air-dispersion modeling for OU 5 were incorporated into the study

- The particle size distribution of the parent soil determines the size distribution of suspended particles This assumption is based on discussions in the *Superfund Exposure Assessment Manual* (EPA 1988b)
- Potential emissions of fugitive particulate matter from the area sources are limited to those generated by wind erosion. There is no vehicular traffic on the sources
- Particulate emissions are zero when wind speeds are less than the threshold wind speed
- Erosion potential is completely and evenly depleted in one hour of an episodic wind event that exceeds the threshold wind speed For wind events lasting more than one hour the erosion potential is renewed at each subsequent hour

### 5 3 3 6 Setup and Calibration of Air Model

This section describes in detail the FDM input parameters regarding sources meteorology and receptors A discussion about the calibration or verification of the model is also presented

*Area Sources* Area sources must be specified as rectangles for the FDM Coordinates and dimensions in feet were obtained from the Louisville Quadrangle 7 5 minute series (topographical) map (USGS 1979) The last five digits of the coordinates were manually converted to meters for the FDM source input parameters

For the OU 5 study five area sources of radiological contamination were modeled (Figure 5 33A) These areas were selected on the basis of the analytical results for surface soil samples with radionuclide activities greater than those of the background UTLs They were defined and modeled prior to the decisions regarding the definition of the three AOCs in OU 5 FDM source input coordinates and dimensions (in meters) and radionuclide levels are presented in Table 5 27A

Within IHSS 115 three area sources of radiological contamination were modeled The sources of radiological contamination in the landfill are thought to be exhumed materials that were brought to the surface during past disturbances of landfill materials Source 1 was specified as a rectangle to encompass a cluster of samples in the middle of the IHSS that showed radionuclide activities greater than those of corresponding UTLs The rectangle was designated to represent uniform emissions within the source Radionuclide levels were obtained by averaging the results of 18 surface soil samples collected within the rectangle Although only 13 samples within the rectangle actually showed radionuclide activities greater than the UTLs data for all surface sample points within the rectangle (excepting those two exhibiting unusually high results) were averaged together to represent the area wide average Source 2 was drawn as a small 25 ft square centered on one surface soil sample that showed unusually elevated levels of uranium isotopes within the Source 1 rectangle The americium 241 and plutonium 239/240 results for the Source 2 sample were negative values so a source strength of zero was assigned for modeling purposes Similarly Source 3 was drawn as a 50 ft square centered to represent a distinct area in the western portion of IHSS 115 where one surface sample showed elevated levels of uranium isotopes

IHSS 133 the ash pits was represented by Sources 4 and 5 as two contiguous rectangles Source 4 was drawn as a larger rectangle encompassing IHSS 133 6 133 5 133 4 133 1 and 133 3 and nearby surface soil sample points Source 5 was drawn as a smaller rectangle encompassing the IHSS 133 2 pits and two surface soil sample points just east of IHSS 133 2 Radiological contamination is distributed more or less evenly across IHSS 133 that is there are no outstanding hot spots Both rectangles representing IHSS 133 were assigned radionuclide levels obtained from the averages of all surface soil samples collected for the IHSS The number of analyzed samples varied with constituent 19 samples for americium 241 22 for plutonium 239/240 17 for uranium 233/234 22 for uranium 235 and 21 for uranium 238

For the OU 5 study five area sources of organic and metallic chemical contamination were modeled (Figure 5 33B) These five areas are not the same as those for the area sources modeled for radiological contamination although their locations are similar and were selected where results of statistically identified COCs were clustered. The FDM source input coordinates and dimensions (in meters) and the concentrations of organic and metallic COCs are presented in Table 5 27B

IHSS 115 contained four area sources of surface soil contamination Source 1 was drawn as a 10-acre square covering the approximate middle third of the old landfill Source 1 contained elevated levels of all 11 COCs Mean concentrations of COCs were obtained by averaging the results of as many as 35 surface soil samples within the area. There are three small areas within the 10 acre Source 1 area, from which samples yielded results that were one or more orders of magnitude higher than the other sample results in Source 1 These higher results were not included in the Source 1 averaging but were treated as distinct, smaller area sources Source 2 was drawn as a 25 ft square centered on one surface soil sample that showed higher levels of benzo(a)anthracene benzo(a)pyrene benzo(b) fluoranthene dibenzo(a,h)anthracene fluoranthene indeno(1 2 3-c d)pyrene and pyrene Source 3 was drawn as a 25 ft square centered on one surface soil sample that showed higher levels of dibenzo(a,h)anthracene fluoranthene and indeno(1 2 3-c d)pyrene Source 4 was drawn as a 25 ft square centered on one surface soil sample that showed higher levels of silver

IHSS 133 contained one area source for the surface soil COCs Source 5 was drawn as a 10 acre rectangle covering the southeast portion of the ashpits (IHSS 133)

*Particle Size Information* Particle size distribution and density characteristics were obtained from the Phase I RFI/RI field geotechnical investigation of OU 5 surface soils (DOE 1994a) On the basis of discussions presented in the *Superfund Exposure Assessment Manual* (EPA 1988b) three particle size classes were selected particles ≤10 μm aerodynamic equivalent diameter that are available for inhalation, particles 10 30 μm diameter range that are suspendible and can be transported considerable distances downwind and particles 30 100 μm diameter range that abrade the soil surface and dislodge smaller particles but themselves settle within a few hundred feet of the source The midpoints of each class were selected as the characteristic particle size diameters 5 μm 20 μm and 65 μm

For particles less than 20 μm. the particle size distribution of the parent soil determines the size distribution of suspended particles (EPA 1988b) Field investigations of the grain size distributions were conducted for IHSS 115 the surface disturbance west of IHSS 209 IHSS 209 and the surface disturbance south of the IHSS 133 ashpits (Table 5 28) The soil grain size distribution of IHSS 115 was assigned to IHSS 133

*Threshold Wind Speed* Friction velocity which is a measure of the wind shear at the erodible surface characterizes the capacity of the wind to cause surface particle movement. Threshold friction velocity is the minimum velocity that results in soil movement Threshold wind speed is the equivalent wind speed at an elevation above ground surface for example 10 meters above ground, which is the standard height of a reference anemometer

The soil surfaces of all IHSSs within OU 5 are nonhomogeneous at least partially vegetated and impregnated with other nonerodible elements such as pebbles cobbles and boulders Such nonhomogeneous surfaces are characterized by the limited availability of erodible soil (Cowherd and others 1985) Such surfaces have high threshold wind speeds for the commencement of wind erosion and particulate emission rates tend to decay rapidly during an erosion event

In 1993 EG&G Rocky Flats Inc contracted Midwest Research Institute to perform a study to quantify wind resuspension emissions of particulate matter from the soils and sediments of OU 3 (DOE 1994c) The test sites were concentrated in three locations the shore around Standley Reservoir the shore around Great Western Reservoir and four terrestrial sites east of Indiana Street When site conditions were undisturbed the average threshold wind speed of the four terrestrial sites was >102 mi/hr When site conditions were severely disturbed by vehicular traffic the average threshold wind speed of three terrestrial sites was 42 mi/hr (18 92 m/s) (The fourth terrestrial site was not examined in a disturbed condition )

Two approaches were applied to determine the threshold wind speed for OU 5 conditions Both approaches were based on a rapid assessment methodology outlined by Cowherd and others (1985) to estimate the threshold friction velocities of soils The first approach used the detailed geotechnical data for OU 5 surface soil samples obtained in the Phase I RFI/RI field investigation (DOE 1994a) to estimate the soil particle size distribution mode Data were corrected for nonerodible elements as discussed in Appendix A of Cowherd and others (1985) Finally the corrected threshold friction velocity was calculated to be approximately 150 cm/s The corresponding threshold wind speed at a 10 m reference anemometer is 24 4 m/s (54 6 mi/hr) When hourly averaged meteorological data for the five years 1988 through 1993 collected at the Rocky Flats Plant were examined not one hour exceeded this OU 5 calculated threshold wind speed of 24 4 m/s

The second approach to estimate a threshold wind speed for OU 5 conditions actually implemented the Cowherd rapid assessment methodology in the IHSSs throughout OU 5 and at the four terrestrial sites examined in the 1993 OU 3 wind tunnel study (Section 2 2 1 7 4) The rapid assessment field study estimated threshold friction velocities at the OU 3 locations two to five times higher than those determined by the OU 3 wind tunnel study The rapid assessment field study estimated threshold wind speeds for OU 5 conditions at 150 mi/hr to 400 mi/hr

The average 10 m threshold wind speed determined for the three severely disturbed terrestrial sites in the OU 3 wind tunnel study (18 92 m/s) was used for the air dispersion modeling of wind resuspended contaminated soils from OU 5 This selection was considered to be conservative because soils at the OU 5 sites generally display more non erodible elements (vegetation and pebbles cobbles and boulders) than the three OU 3 locations and moreover are not disturbed A total of 11 days throughout the 5 year period were identified with wind speeds exceeding this lower threshold wind speed

A threshold friction velocity of 1 17 m/s was calculated from the 10 m threshold wind speed of 18 92 m/s by using the logarithmic velocity profile equation (EPA 1985 Seinfeld 1986) A macro scale roughness height for Rocky Flats 1 5 cm was used in the calculation (DOE 1994c)

*Erosion Potential and Emission Rates* The erosion potential for a dry exposed surface is given by

$$P(u) = 58(u \quad u\ )^2 \quad 25(u \quad u\ ) \qquad \text{(Equation 5 3 3 1)}$$

where

P(u) = erosion potential g/m$^2$

u = friction velocity m/s

u = threshold friction velocity m/s

This equation for erosion potential was determined empirically for industrial coal piles and other exposed materials using a portable wind tunnel like that utilized for the OU 3 wind tunnel study (EPA 1985 Midwest Research Institute 1988) The OU 3 wind tunnel study (DOE 1994c) found that this equation for industrial wind erosion potential substantially exceeds the measured erosion potentials for the highly disturbed surfaces tested in OU 3

Again using the logarithmic velocity profile equation the ground surface wind speed is related to the 10 m wind speed $u_{(10m)}$ by 0 062$u_{(10m)}$

For the OU 5 conditions discussed above the erosion potential equation becomes

$$P(u) = 58(0\ 062u \quad 1\ 17)^2 + 25(0\ 062u \quad 1\ 17) \ \text{g/m}^2 \qquad \text{(Equation 5 3 3 2)}$$

where

u = $u_{(10m)}$ wind speed at 10 meters

Completing the multiplications the equation becomes

$$P(u) = 0\ 222952u^2 \quad 6\ 86464u + 50\ 1462 \qquad \text{(Equation 5 3 3 3)}$$

Assuming that the entire erosion potential is depleted in a 1 hour episodic wind event, the particulate matter emission rate can be calculated by dividing the P(u) equation by 3 600 s/hr

$$E_{PM} = 6\ 19311E\ 05u^2 \quad 1\ 90684u + 1\ 39295E\ 02 \qquad \text{(Equation 5 3 3 4)}$$

where

$E_{PM}$ = fugitive particulate matter emission rate $g/m^2$ s

u = $u_{(10m}$ wind speed at 10 meters

The erosion potential and the emission rate equations are dependent on wind speed in a quadratic format that the most current published version of the FDM version 94040 cannot accommodate The FDM versions available through the EPA Technology Transfer Network are written in a first-order relationship to wind speed Because of this limitation Mr Kirk Winges the author of the FDM prepared a special version of the 94040 FDM that provides the additional capability of entering emission sources as a quadratic formula for the threshold wind speed case (Winges 1994) The modification is in Card 14A of the FDM input file which is written in the format

$$E_{PM} = G_1u^2 + G_2u + G_3 \qquad \text{(Equation 5 3 3 5)}$$

where

$E_{PM}$ = fugitive particulate matter emission rate $g/m^2$ s sometimes termed Q

$\left.\begin{matrix} G_1 \\ G_2 \\ G_3 \end{matrix}\right\}$ = coefficients determined as discussed for Equations 5 3 3 3 and 5 3 3-4

u = $u_{(10m)}$ wind speed at 10 meters

The range of the FDM output values is limited to values that are neither too small nor too large for the number of significant figures and decimal point placement available in the model If the concentration or deposition results are too small the FDM reports the results as 0 0000 If the concentration or deposition results are too large the FDM reports the results as ****** To accommodate this limitation a multiplier can be applied to the G coefficients so that the FDM will provide actual numerical results The multiplier is selected on a case by-case basis typically by trial and error depending on the order of magnitude of the COC concentration Interpreting the model output results must be done with this multiplier in mind because the multiplier determines the order of magnitude of the output values (Table 5 29)

A COC emission rate is determined by multiplying the fugitive particulate matter emission rate by the COC concentration in the soil (pCi/g of soil for radionuclides)

$$E_{aminan} = X (E_{PM}) \qquad \text{(Equation 5 3 3 6)}$$

where

$E_{contaminant}$ = COC emission rate pCi/m$^2$ s

X = contaminant concentration pCi/g

$E_{PM}$ = fugitive particulate matter emission rate g/m s

To summarize the coefficients $G_1$ $G_2$ $G_3$ in the quadratic wind speed-dependent equation for Card 14A of the FDM were determined multiplying the coefficients of the terms in the emission rate equation for fugitive particulate matter first by an arbitrary multiplier and second by the COC concentration The FDM output values are in terms of COC not particulate matter concentrations and depositions the magnitudes of which were determined by the selected multiplier This process is summarized for americium 241 (Table 5 30) The values for all constituents are evident in the source terms of the FDM input files presented in Appendices I through L

*Meteorological Input* EG&G Air Quality Department provided preprocessed meteorological data for the full calendar years 1989 through 1993 Data originated from the Site meteorological tower which is located about 2 km northwest of OU 5 Instrumentation is at 10 m elevation above ground level The site meteorological data are collected in 15 minute averages However this time period is not suitable for air dispersion modeling with the FDM Consequently the meteorological information were compiled into 1 hour averages Input included wind speed (m/s) wind direction (degrees from north) stability class (Turner classification) mixing height (m) and ambient temperature (degrees Kelvin) Stability classes were determined from the standard deviation of the horizontal wind direction (EPA 1986) Mixing heights were estimated from Holzworth (1972) Missing data were treated according to EPA policies (EPA 1986)

*Receptors* Selection of receptors was based on the potentially complete and relatively insignificant exposure pathways that were previously selected for quantitative risk assessment for exposures to radionuclides organic compounds and metals (DOE 1995b) Potential receptors are associated with unspecified locations in the three AOCs within the OU 5 study area. AOC1 is IHSS 115 the original landfill AOC2 is IHSS 133 the ash pits and AOC3 is the Woman Creek drainage

For modeling of maximum impacts of potential receptor points associated with AOC1 and AOC2 north south rows of receptors at 100 ft spacing were positioned on the east (downwind) edge of the larger rectangular area sources discussed above or directly east of the area sources that were rotated from the north south axis (Tables 5 31A and 5 31B Figures 5 34A and 5 34B) These receptors were dubbed the Near Group receptors The Near Group receptors for modeling of radionuclide COCs and organic compound COCs although termed alike were positioned somewhat differently because the area sources for each type of contamination were drawn differently The Near Group receptors were modeled using the FDM convergent algorithm for area sources

For modeling of maximum impacts within AOC3 the Woman Creek drainage a Grid Group of receptors at 1 000 ft spacings throughout the entire OU 5 study area was designed Receptor #22 was closest to Woman Creek and also downwind from IHSSs 115 and 133 To the Grid Group were added RAAMP samplers 13 14 23 32 and 38 (Table 5 31C Figure 5 35) RAAMP samplers 13 14 23 and 38 are situated in or near the Woman Creek Drainage RAAMP sampler 32 was chosen as an upwind background sampler The Grid Group was modeled using the 5 line integration default for area sources

*Verification* Verification of the FDM for the OU 5 investigation was accomplished by comparing model output with ambient air monitoring data collected by the RAAMP and special OU 5 samplers The conclusions of these verification procedures relate to the accuracy of the model and the uncertainty of the output Ambient air data available for verification are limited to those months when data from the OU 5 samplers were reported and when winds exceeding the threshold wind speed of 18 92 m/s were recorded by the Rocky Flats Plant meteorological tower

Three special OU 5 ambient air samplers were installed in the summer of 1992 and became operable in October 1992 Sampler S102 is located north and west of OU 5 as an upwind monitor Sampler S100 is situated downwind of IHSS 115 Sampler S101 is placed downwind of IHSS 133 Procedures for the OU 5 samplers are the same as for the RAAMP samplers filters are collected biweekly Once a month the two filters collected from each air monitoring station are composited prior to isotopic analysis Radionuclides analyzed for the OU 5 filters are americium 241 plutonium 239/240 uranium 233/234 uranium 235 and uranium 238 As of March 1 results of 12 samples from each monitor representing the period October 9 1992 to August 4 1993 had been entered into RFEDS Of the 12 samples only the first two samples (October 9 1992 and November 10 1992) had been completely validated at the time of this modeling

RAAMP samplers 13 14 23 and 38 are in or near the Woman Creek drainage However RAAMP data did not prove useful for verification purposes because filters from these samplers are analyzed only for plutonium 239/240 Furthermore the locations of these samplers were chosen to monitor sitewide conditions rather than point sources or even area sources such as OU 5

During the period October 9 1992 to August 4 1993 only the period December 30 1992 to January 26 1993 exhibited wind speeds with 1 hour averages exceeding the selected threshold wind speed of 18 92 m/s (42 32 mi/hr) These occurred on January 21 1993 hours 8 and 9 when winds averaged 22 96 m/s and 19 23 m/s respectively The wind speed of 22 96 m/s is the highest 1 hour average wind speed recorded for the years 1989 through 1993

Verification runs for the FDM using the five line integration default modeled the period January 1 31 1993 Model output was compared with the OU 5 ambient air data for the period December 30 1992 to January 26 1993 (Table 5 32) FDM input and output files for the verifications runs are included in Appendix I Model runs utilizing the convergent algorithm for near source receptors produced output results substantially the same as model runs with the five line integration Model results for americium 241 were two and four orders of magnitude below ambient levels for plutonium, model results were one order of magnitude below ambient levels Model output values for uranium 233/234 and uranium 235 fell within the same order of magnitude as the ambient data. Model results for uranium 238 were one order of magnitude above the ambient data.

*Uncertainty and Accuracy* A succinct discussion of the accuracy and uncertainty of models is presented in EPA s *Guidelines on Air Quality Models* (EPA 1986) Air-dispersion models are more reliable for longer term averaged concentrations than for short term concentrations at specific locations Models are reasonably reliable for estimating the magnitude of highest concentrations occurring sometime somewhere in the area. Air dispersion models are recognized to exhibit an accuracy within a factor of two and are typically more accurate

Model uncertainties fall into two categories inherent and reducible Inherent uncertainties arise from unmeasured or unknown conditions of an event and may vary among repetitions of the event Such uncertainties would exist in even the perfect model and may account for a typical range of variation in output values of as much as 50 percent Reducible uncertainties are associated with the model and it input conditions Improvements in the physics of the model and the accuracy of the input parameters can minimize the amount of reducible uncertainty

Improvements to the mathematical algorithms of a sanctioned public-domain model like the FDM are generally limited As discussed above the source input mechanism of the FDM was adjusted by the model developer to account for the quadratic form of the wind-erosion equation as applied in this study (Winges 1994) This modification addressed input formats rather than model mathematics

Two important issues relate to the verification of the air dispersion model in the OU 5 situation The first is the multiplicity of radionuclide sources in the OU 5 and the Site vicinity The sources of the radionuclides on the OU 5 sampler media do not originate solely from the IHSSs of OU 5 An examination of the OU 5 sampler data for the period December 30 1992 to January 26 1993 for americium 241 illustrates this point (Table 5 32) Americium 241 levels on the upwind sampler S102 are higher than on the downwind samplers S101 and S100 Restricting the emission sources that contribute to any receptor in the site vicinity such as the OU 5 samplers for verification purposes to the IHSSs of OU 5 is a simplifying convention for modeling purposes only In actuality there are no real world ambient data attributable only to OU 5 sources

The second issue concerns the wind resuspension rate of contaminated soil As of the date of this report a study of the wind resuspension potential such as that conducted at OU 3 (DOE 1994c) has not been performed for OU 5 As a result, the values obtained in the OU 3 study were assumed to be applicable to OU 5 for the purposes of OU 5 air-dispersion modeling Several model runs were performed to investigate the sensitivity of the FDM to values for roughness height and threshold friction velocity Roughness height was varied from 0 022 cm to 1 5 cm Threshold friction velocity was varied from 40 cm/s to 117 cm/s Threshold wind speed was maintained at 18 92 m/s The model output values generally remained within the same or one order of magnitude during this sensitivity analysis (i e the FDM is relatively insensitive to variations related to threshold friction velocity)

Comparison of the model results with ambient air data collected at OU 5 samplers and sensitivity runs indicates that the FDM output values of radionuclide concentrations are accurate within one order of magnitude

### 5 3 3 7 Results of Air Modeling

Air modeling runs to estimate the maximum values for deposition and exposure concentrations at the selected OU 5 receptor points were performed with the FDM using the input parameters described in Section 5 3 3 5 The input and output files for the FDM runs for radionuclide COCs are included in Appendix J for organic COCs in Appendix K and for metal COCs in Appendix L

Modeling exercises utilizing the five line integration algorithm on the grid group of receptors were conducted for each of the five years of available meteorological data (1989 through 1993) to ascertain the year of maximum exposure The year demonstrating the maximum values for annual average concentration and deposition for the selected receptors was 1990 (Table 5 33) The year 1990 exhibited 14 hours of 1 hour average wind speeds exceeding the selected threshold wind speed of 18 92 m/s These high winds occurred in three episodes For high wind episodes lasting more than one hour it was assumed that the erosion potential was renewed with each successive hour

During 1990 the highest 24 hour averages of ambient concentration and deposition of COCs for the downwind receptors occurred on December 14 (Table 5 34) The highest 1 hour average wind speed during 1990 was 22 72 m/s which occurred toward the end of a sustained high wind episode during Hour 22 on December 14 For all of 1990 the maximum 1 hour concentration and deposition values for selected OU 5 receptors generally occurred during that hour or on another hour of December 14 (Table 5 35) The times of the maximum values for the receptors vary somewhat because the readings at a particular receptor depend on wind direction as well as wind speed

### 5 3 4 Indoor Air Modeling

#### 5 3 4 1 Objectives of Indoor Air Modeling

The scenario of the intrusion of soil gases through the below grade foundation floor and walls of a future on site office building has been identified as significant air exposure pathway for the OU 5 IHSSs (DOE 1995b) Presently no buildings are located in OU 5 The objective of the indoor air modeling was to estimate the exposure concentrations of COCs that are released into indoor air by intrusion of the gaseous phase directly from the vadose zone of the soils surrounding the floors and walls of future building foundations

#### 5 3 4 2 Selection of Indoor Air Model

EPA provides technical guidance for assessing potential indoor air impacts for contaminated sites (EPA 1992a) For modeling the concentrations of chemical vapors in indoor air due to soil gas entry the Johnson Ettinger models are recommended (EPA 1992a, Johnson and Ettinger 1991) The model equation corresponding to an infinite contaminant source and vapor infiltration through cracks/openings in the foundation is the most useful for general application This model equation was selected for supporting the HHRA of potential indoor air impacts for OU 5 It is described fully in TM13 (DOE 1994b) as well as in the resource documents (EPA 1992a, Johnson and Ettinger 1991)

#### 5 3 4 3 Conceptual Model for Indoor Air

The transport of contaminants from soil gas into a building foundation is understood to occur by a combination of convective and diffusive transport mechanisms The relative significance of these mechanisms depends on site characteristics In the case where the contaminant source lies directly beneath the foundation the convection mechanism dominates the transport of vapors into the building If the source is distant from the foundation, transport is controlled by diffusion from the source to the foundation Potential contaminant risks associated with indoor air of future buildings contaminated from VOCs in soils adjacent to the foundation will be evaluated in the HHRA

### 5 3 4 4 Assumptions and Limitations for Indoor Air Model

Assumptions and limitations inherent in the Johnson Ettinger equation corresponding to the general application in which the contaminant source is infinite with respect to the modeling time of interest and vapor infiltration is through cracks or openings in the foundation, include the following

- The distance from the source to the building is assumed not to change with time and is assumed not to change in composition over the time of interest for the calculation
- The contaminant source is assumed to lie directly beneath the foundation
- The modeling equation applies to structures with crawl spaces and slab floor construction with solid (i e poured concrete) below grade walls Other Johnson Ettinger modeling equations correspond to cases in which soil gas transport into buildings is substantially higher through relatively permeable materials (e g concrete block construction below grade) than through foundation cracks and openings or to cases in which a contaminant is located near the building and decreases over time (EPA 1992a)

### 5 3 4 5 Set Up and Calibration of Indoor-Air Model

Information concerning dimensions and ventilation characteristics of typical commercial buildings for Jefferson County Colorado was obtained from the Jefferson County Building Department (Nihiser pers comm 1993) This information along with building material published in the source documents (EPA 1992a Johnson and Ettinger 1991) was used to determine those additional properties required for the indoor air modeling of the intrusion of soil gas into future onsite building structures (Table 5 36)

A real time soil gas survey was conducted as part of the Phase I RFI/RI field investigation The purpose of this survey was to identify areas of VOC contamination within IHSS 115 and IHSS 196 The methodology and findings of the soil gas survey are discussed in TM15 (DOE 1994a) The survey resulted in the identification of three areas of anomalous concentrations of organic compounds above the reporting limits The three identified VOCs were 1 1 1 TCA TCE and PCE (Table 5 37)

The volummetric flow rate of a soil gas into a building foundation is related to the vapor viscosity of the gas Vapor viscosity is inversely proportional to temperature (Table 5 38) The lower values for vapor viscosity were used in the Johnson Ettinger calculations

The Johnson Ettinger equation calculates a ratio ($\alpha$) of the gas concentration inside the building to the soil gas concentration at the source

(Equation 5 3 4 1)

$$\alpha = [D_T^{eff} A_B / Q_{bldg} L_T] * \exp(Q_{soil} L_{crack} / D^{crack} A_{crack}) / \{\exp(Q_{soil} L_{crack}/D^{crack} A_{crack}) + [D_T^{eff} A_B / Q_{bldg} L_T] + [D_T^{eff} A_B / Q_{soil} L_T][\exp(Q_{soil} L_{crack}/D^{crack} A_{crack}) - 1]\}$$

where

$\alpha$ = $C_{building}/C_{source}$ vapor concentration in building/vapor concentration at source (i e soil)

$D_T^{eff}$ = overall effective diffusion coefficient (cm$^2$/sec)

$A_B$ = cross sectional area through which contaminants may pass (approximated by area of floor and below grade walls (cm$^2$)

$Q_{bldg}$ = building ventilation rate (cm$^3$/sec)

$L_T$ = distance from contaminant source to building foundation (cm)

$Q_{soil}$ = volummetric flow rate of soil gas into the building (cm$^3$/sec)

$L_{crack}$ = thickness of foundation (cm)

$D^{crack}$ = effective vapor pressure diffusion coefficient through a crack (cm$^2$/sec)

$A_{crack}$ = area of cracks/openings through which vapors can pass (cm$^2$)

If the source lies directly beneath the foundation as it would in the exposure scenario of contaminated soil adjacent to the foundation then $\alpha$ approaches the value $Q_{soil}/Q_{bldg}$

The soil gas flow rate $Q_{soil}$ is likely to be dependent of the basement crack area, $A_{crack}$ soil type and stratigraphy building underpressurization and basement geometry For simplicity $Q_{soil}$ is estimated by

(Equation 5 3 4 2)

$$Q_{soil} = 2\pi \Delta P k_v X_{crack} / \mu \ln(2 Z_{crack}/r_{crack})$$

where

$r_{crack}/Z_{crack} << 1$

(Equation 5 3 4 2 is an analytical solution for flow to a cylinder of length $X_{crack}$ and radius $r_{crack}$ located at a depth $Z_{crack}$ below the surface This is an idealized model for soil gas flow to cracks located at floor/wall seams )

where

| | | |
|---|---|---|
| $\Delta P$ | = | building pressure difference relative to ambient pressure (g/cm sec$^2$) |
| $k_v$ | = | soil permeability to vapor flow (cm$^2$) |
| $X_{crack}$ | = | total floor/wall seam perimeter distance (cm) |
| $\mu$ | = | vapor viscosity (g/cm sec) |
| $Z_{crack}$ | = | depth of crack below ground surface (cm) |

and

| | | |
|---|---|---|
| $r_{crack}$ | = | $\eta A_B/X_{crack}$ |

where

| | | |
|---|---|---|
| $\eta$ | = | $A_{crack}/A_B$ so that $0 <= \eta <= 1$ |

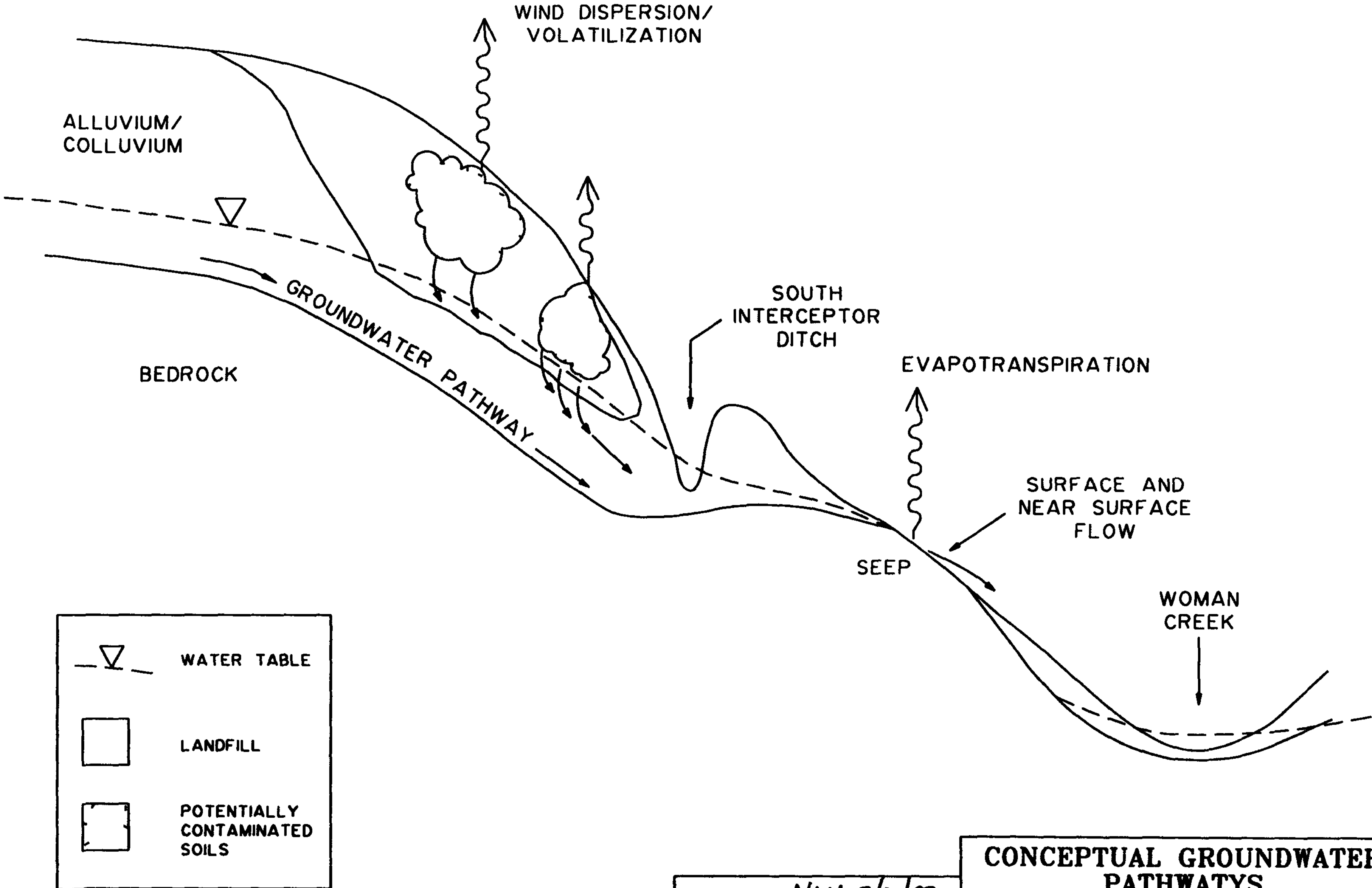
For a contaminant source adjacent to the building ($L_T = 0$) $\alpha$ is proportional to the soil permeability to vapor flow $k_v$ at $k_v > 10^{-8}$ cm$^2$ (permeable soils) The effect of crack size on contaminant intrusion rates will be relatively insignificant in the limit of convective-dominated transport.

Resolution of uncertainty cannot be addressed fully within the scope of this assessment The future exposure scenarios for onsite office structures are hypothetical Calibration of any indoor air models with actual onsite measurements is not feasible

### 5 3 4 6 Results of Indoor Air Modeling

Execution of the Johnson Ettinger model was performed for the building soil and chemical properties as outlined in Section 5 3 4 5 A typical future onsite commercial building was considered to be 6 000 ft$^2$ (557 m$^2$) with 0 5 air changes per hour and a building underpressure of 1 Pa (10 g/cm s$^2$) Modeling was performed for the building sizes and air changes per hour indicated in Table 5 36 A range of underpressure values was not modeled The relationship of underpressure air to indoor air concentrations in the model is linear a ten fold increase in building would increase indoor gas concentrations by ten A single soil permeability of 10 darcy ($10 \times 10^{-8}$ cm$^2$) was modeled as typical Soil permeability also linearly affects indoor air concentrations of COCs in the model a ten fold increase in soil permeability would increase indoor gas concentrations by ten The maximum concentrations of soil gases detected during the field investigation were used as input to the model Results of the modeling study are presented as typical values and as ranges of values for concentrations of identified VOCs in the basement areas of the hypothetical buildings (Table 5 39)

A number of studies referenced in the EPA guidance document (EPA 1992a) have indicated that the mean concentration of radon in basements is about twice the mean value for above ground living spaces The conclusion of these studies can be extended to organic gases The levels of air contaminant concentrations in the working spaces of future onsite buildings are estimated to be approximately half those in the associated basements as presented in Table 5 39

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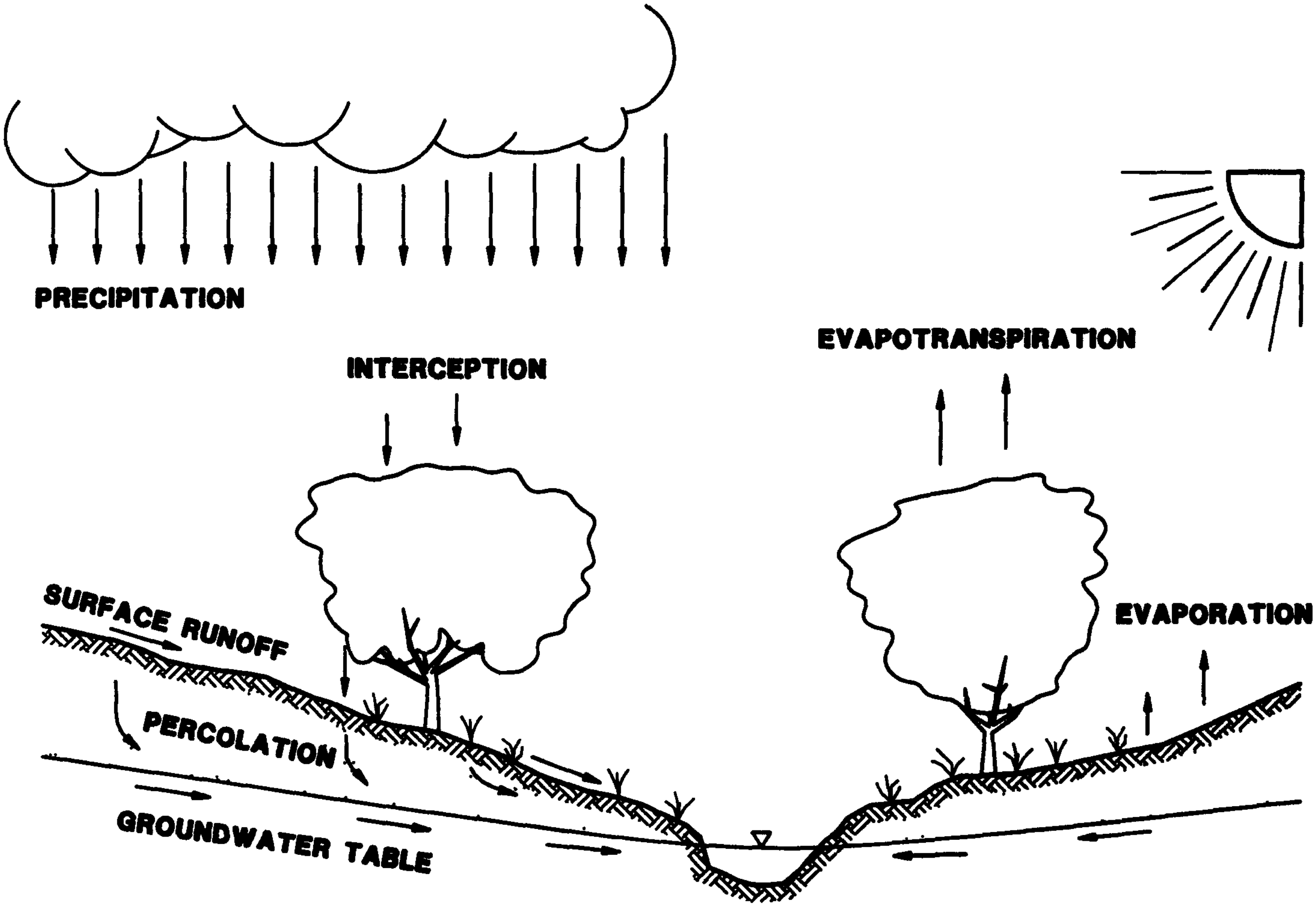
**CONCEPTUAL GROUNDWATER PATHWATYS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-1




Source Bicknell and Others (1993)

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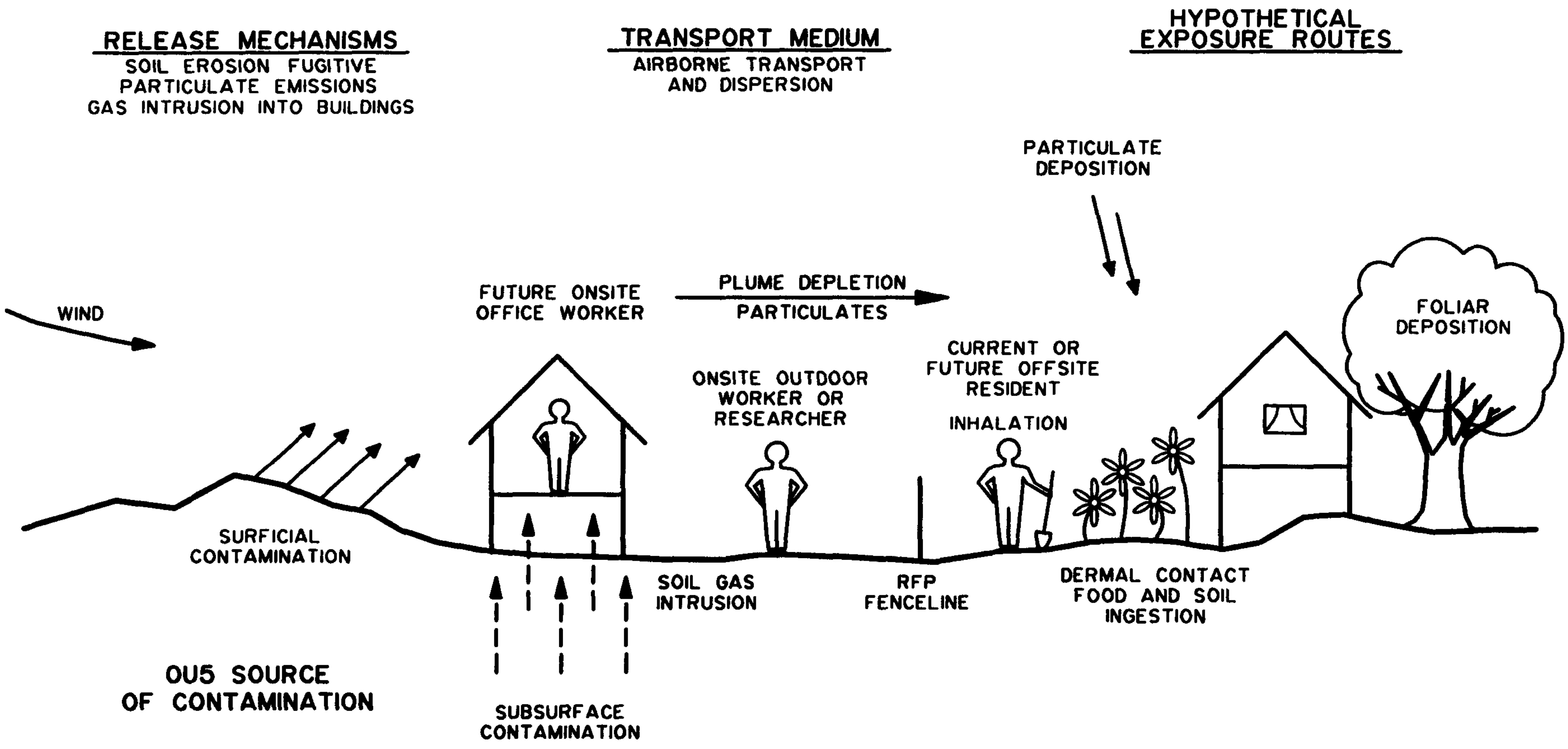
| App oved Date | OU5 – WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5-5-2 DWG | FIGURE 5-2 |

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**CONCEPTUAL AIR PATHWAYS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-3


## Legend

No Flow

Constant Head

63093 Monitoring W ll

Co to r Line 20

Road

Individual Hazardous Substance Sit

N

200 feet

| | |
|---|---|
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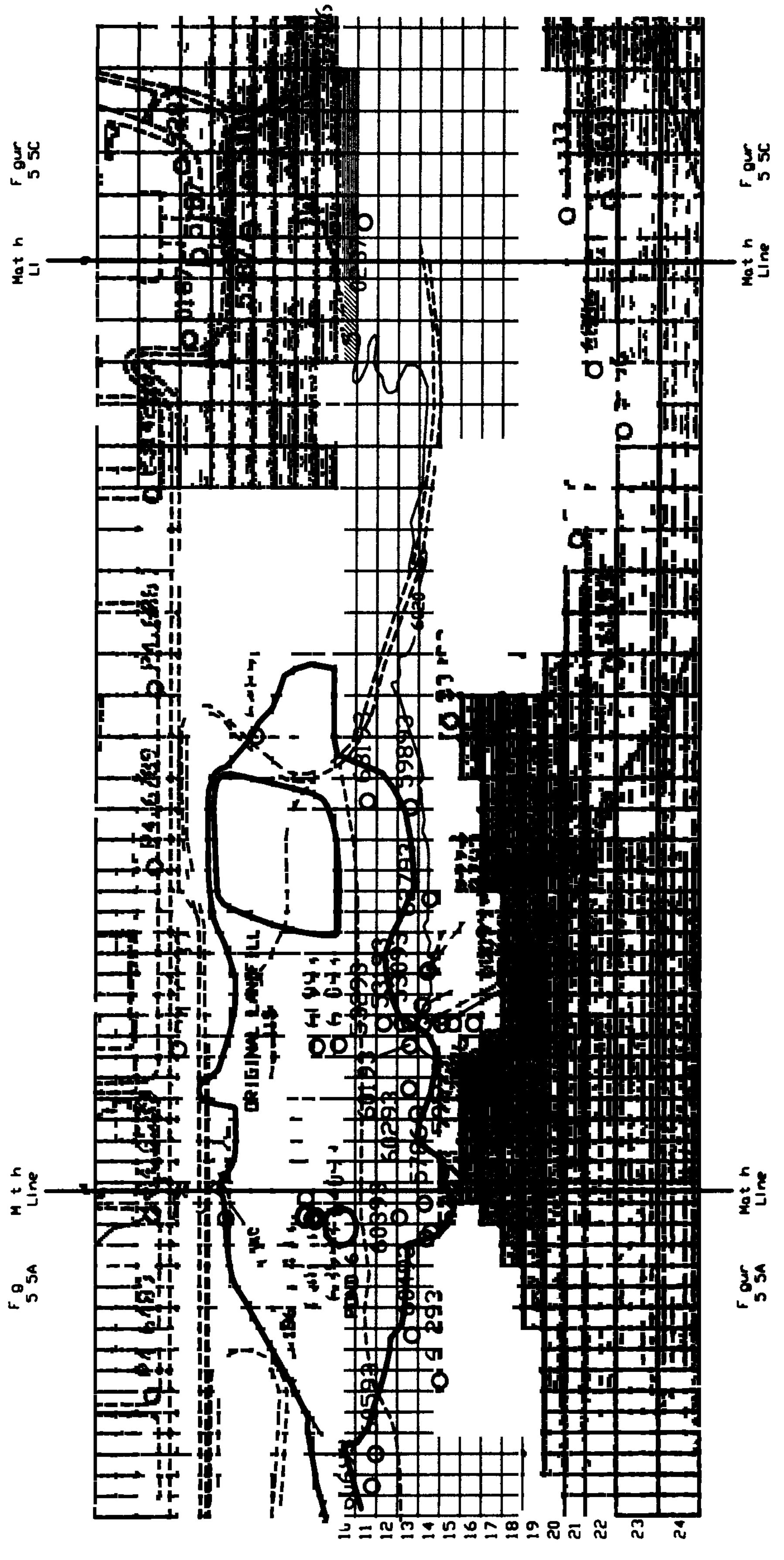
**OU5 GROUNDWATER FLOW MODEL GRID**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-5A




Legend

No Flow

Constant Head

61893 Monitoring Well

Topographic Contour Line 20

Road

Individual Hazardous Substance Site

N

200 feet

Drawn LAB 8/9/95 Date

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Approved ______ Date

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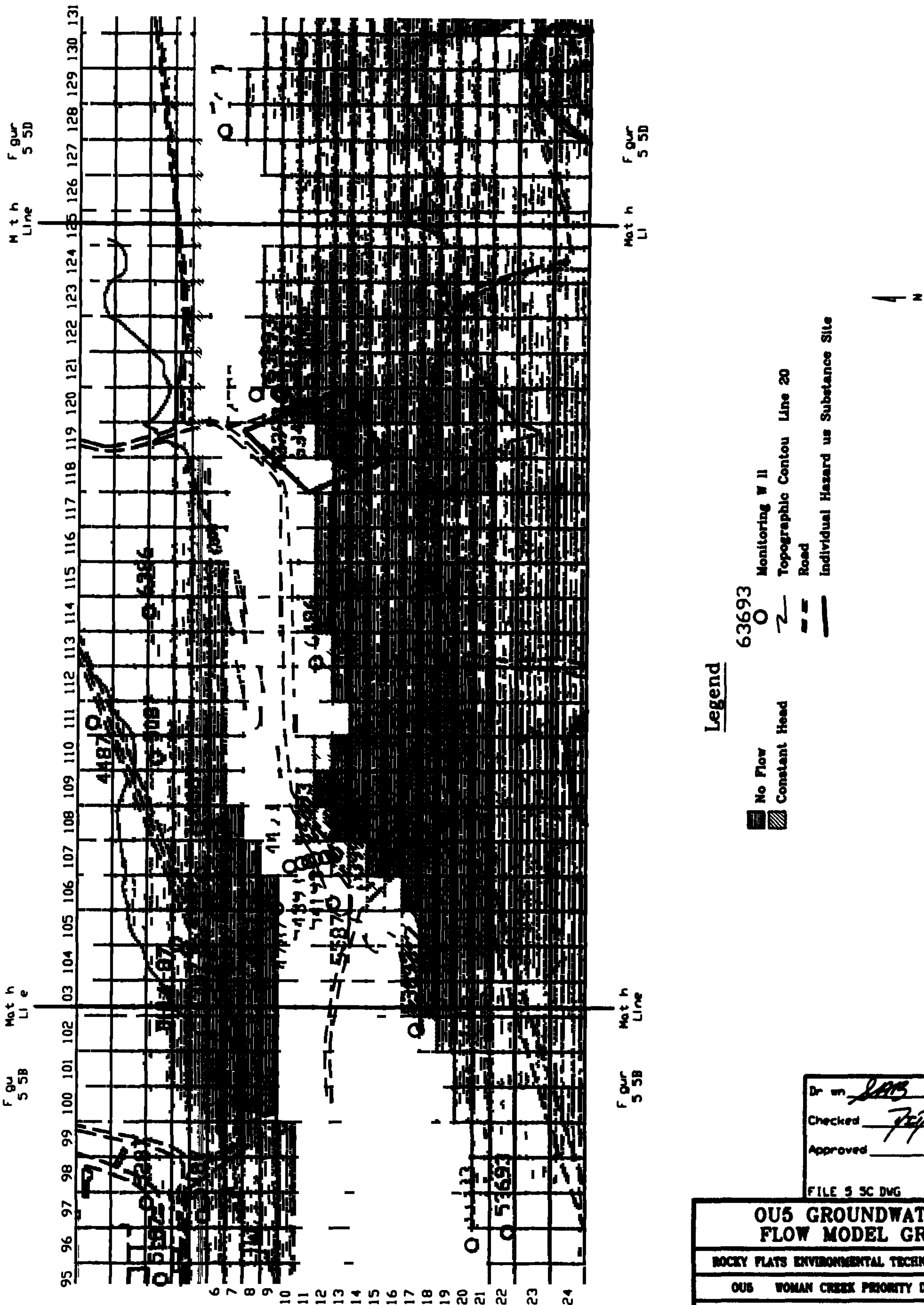
# OU5 GROUNDWATER FLOW MODEL GRID

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-5B

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| FILE 5 5C DWG | |

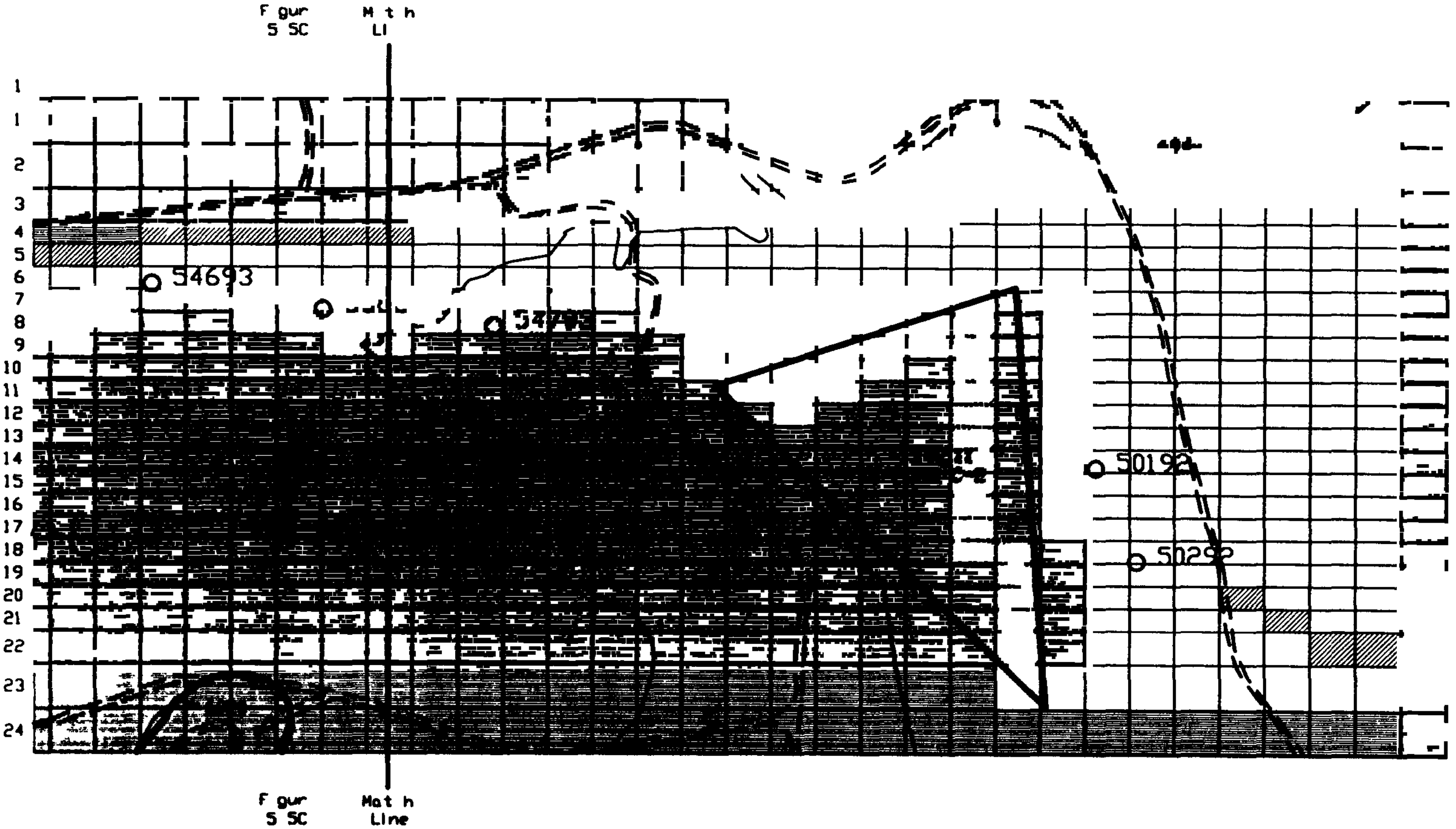
**OU5 GROUNDWATER FLOW MODEL GRID**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-5C




## Legend

No Flow

Constant Head

63093

Monitoring W ll

T pographi Contour Li 20

Road

Individual Hazardous Substance Site

N

200 feet

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**OU5 GROUNDWATER FLOW MODEL GRID**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-5D


## Legend

- N Flow
- Zone 1 = (2.88 10 3) ft/day
- Zon 2 (2.89x10 3) ft/day
- Zone 3 = (2 59) ft/day
- Zone 4 = (34 56) ft/day

- Road
- Individual Hazard u S bstan e Site

N

200 feet

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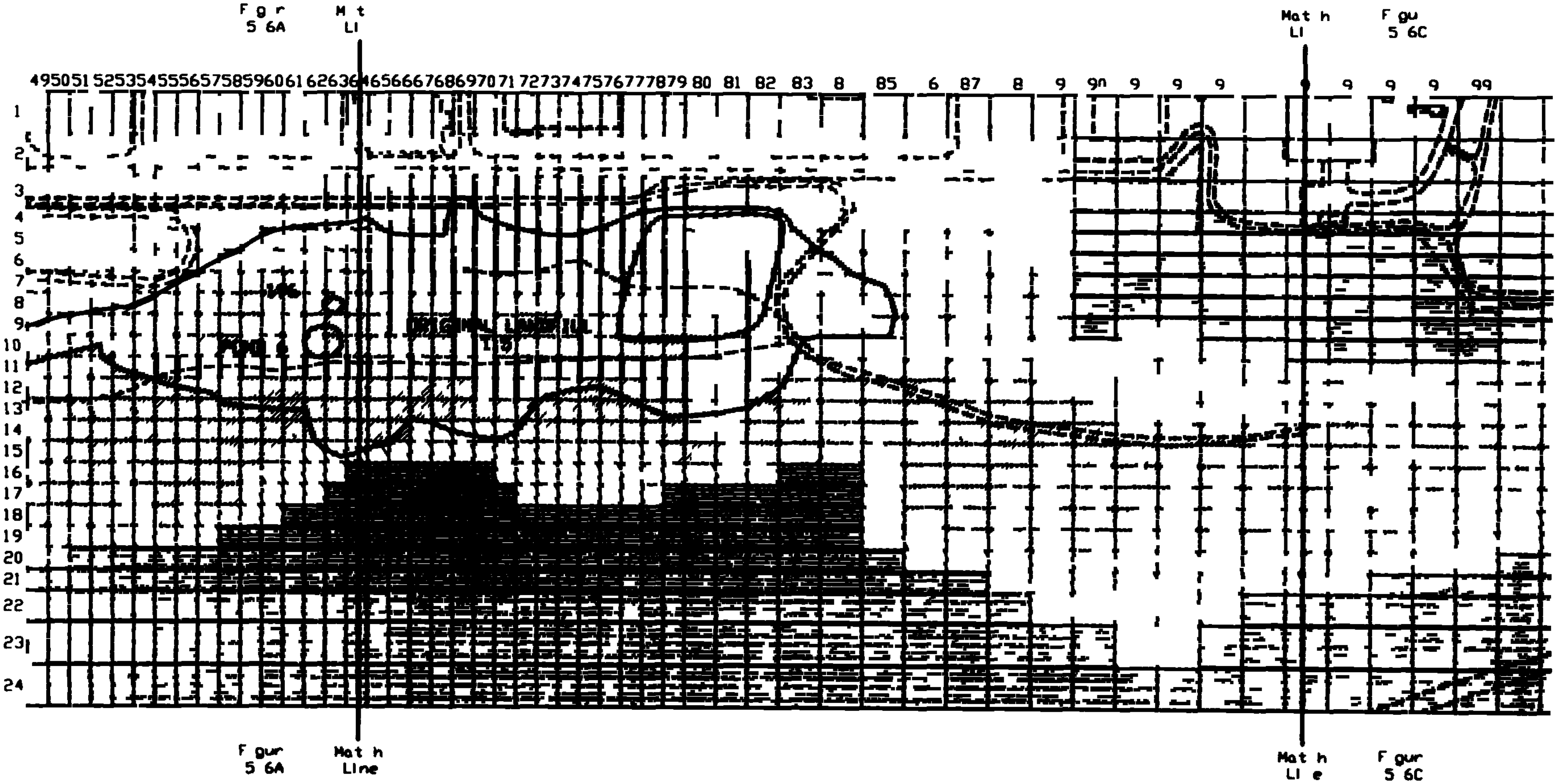
**OU5 GROUNDWATER FLOW MODEL INITIAL HYDRAULIC CONDUCTIVITY ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-6A

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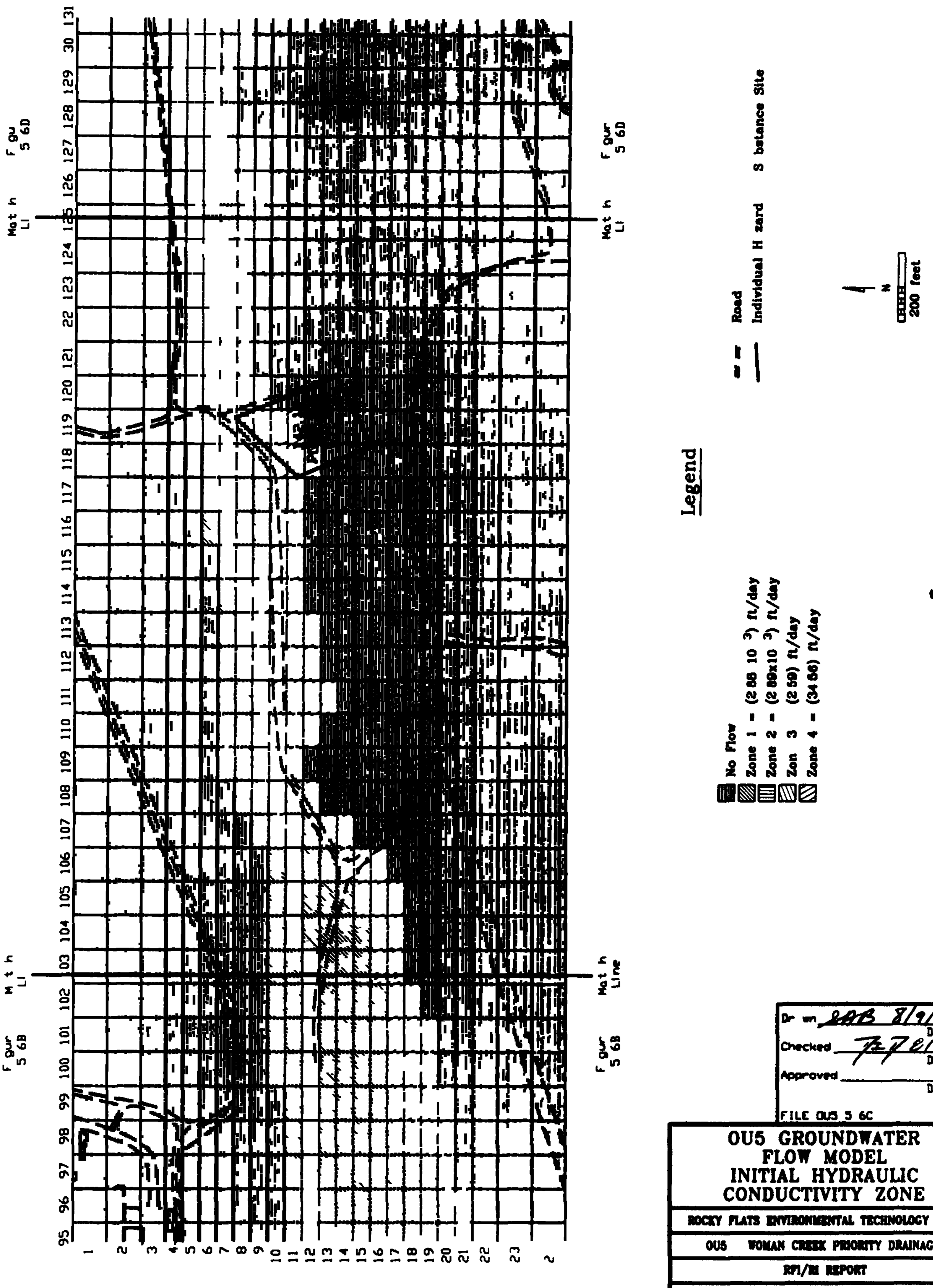
# OU5 GROUNDWATER FLOW MODEL INITIAL HYDRAULIC CONDUCTIVITY ZONES

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-6B

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| Approved | Dat |
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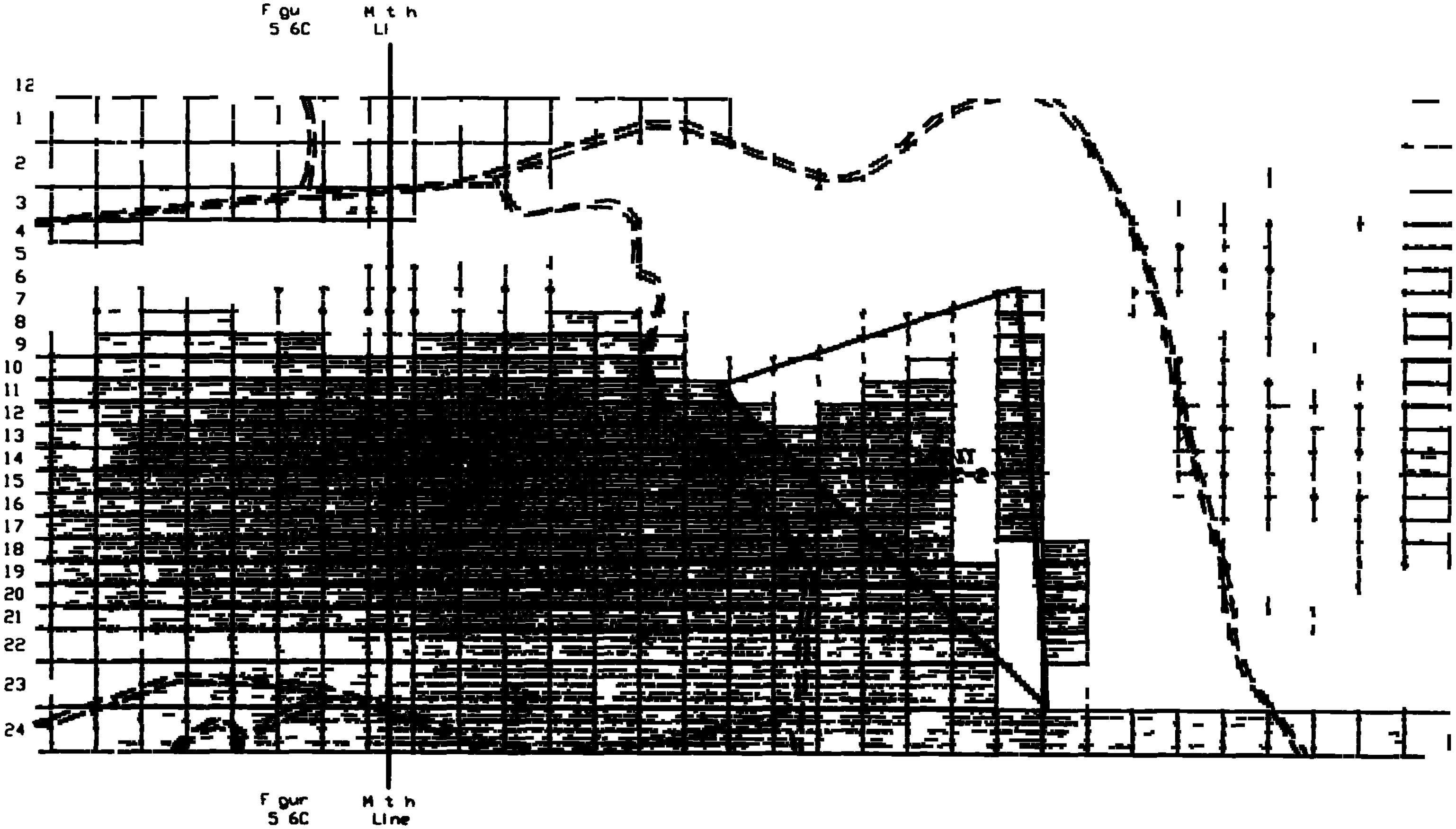
**OU5 GROUNDWATER FLOW MODEL INITIAL HYDRAULIC CONDUCTIVITY ZONE**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-6C




## Legend

N Flow
Zone 1 (2 88x10 $^{3}$) ft/day
Zone 2 = (2 89x10 $^{3}$) ft/day
Zone 3 (2.59) ft/day
Zon 4 = (34 56) ft/day

Road
Individual H zard u S bstance Site

N
200 feet

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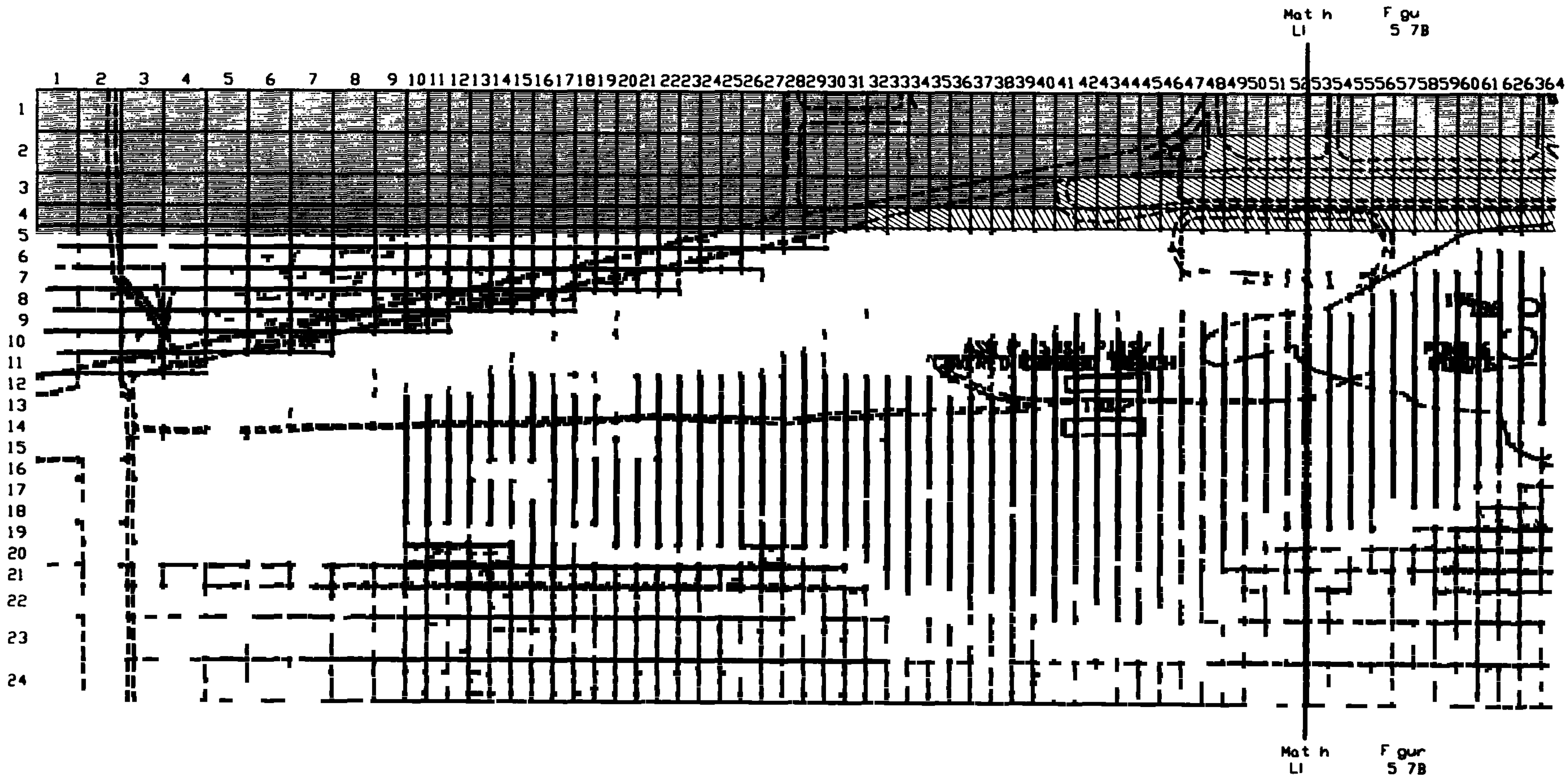
# OU5 GROUNDWATER FLOW MODEL INITIAL HYDRAULIC CONDUCTIVITY ZONES

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-6D




## Legend

- N Flow
- Zone 1 = (-5 2x10 $^{3}$) ( 1 7x10 $^{3}$) ft/day
- Zone 2 = (1 6 10 $^{3}$) ft/day
- Zone 3 = (1 7 10 $^{3}$) ft/day
- Zone 4 = (1 9 10 $^{3}$) ft/day
- Zone 5 = (2 1 10 $^{3}$) ft/day
- Road
- Individ al H zard s S bsta ce Site

N

200 feet

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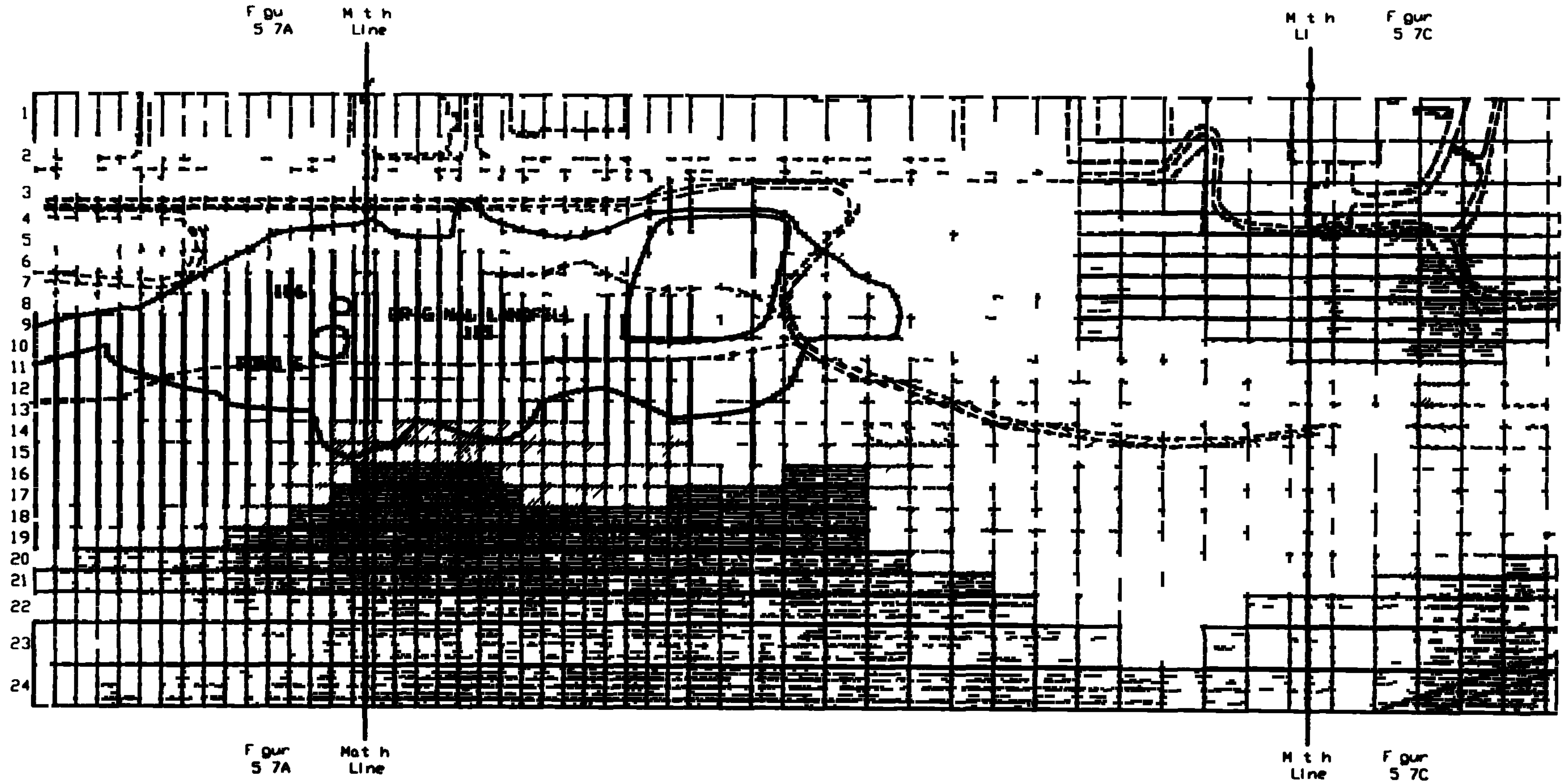
# OU5 GROUNDWATER FLOW MODEL INITIAL RECHARGE ZONES

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-7A




## Legend

- No Flow
- Zon 1 = (−5 2x10 $^{3}$) ( 1 7x10 $^{3}$) ft/d y
- Zone 2 (1 6x10 $^{3}$) ft/day
- Zo 3 = (1 7x10 $^{3}$) ft/day
- Zone 4 (1 9x10 $^{3}$) ft/day
- Zo 5 = (2 1 10 $^{3}$) ft/day

- Road
- I dividual H zard S bstance Site

N
200 feet

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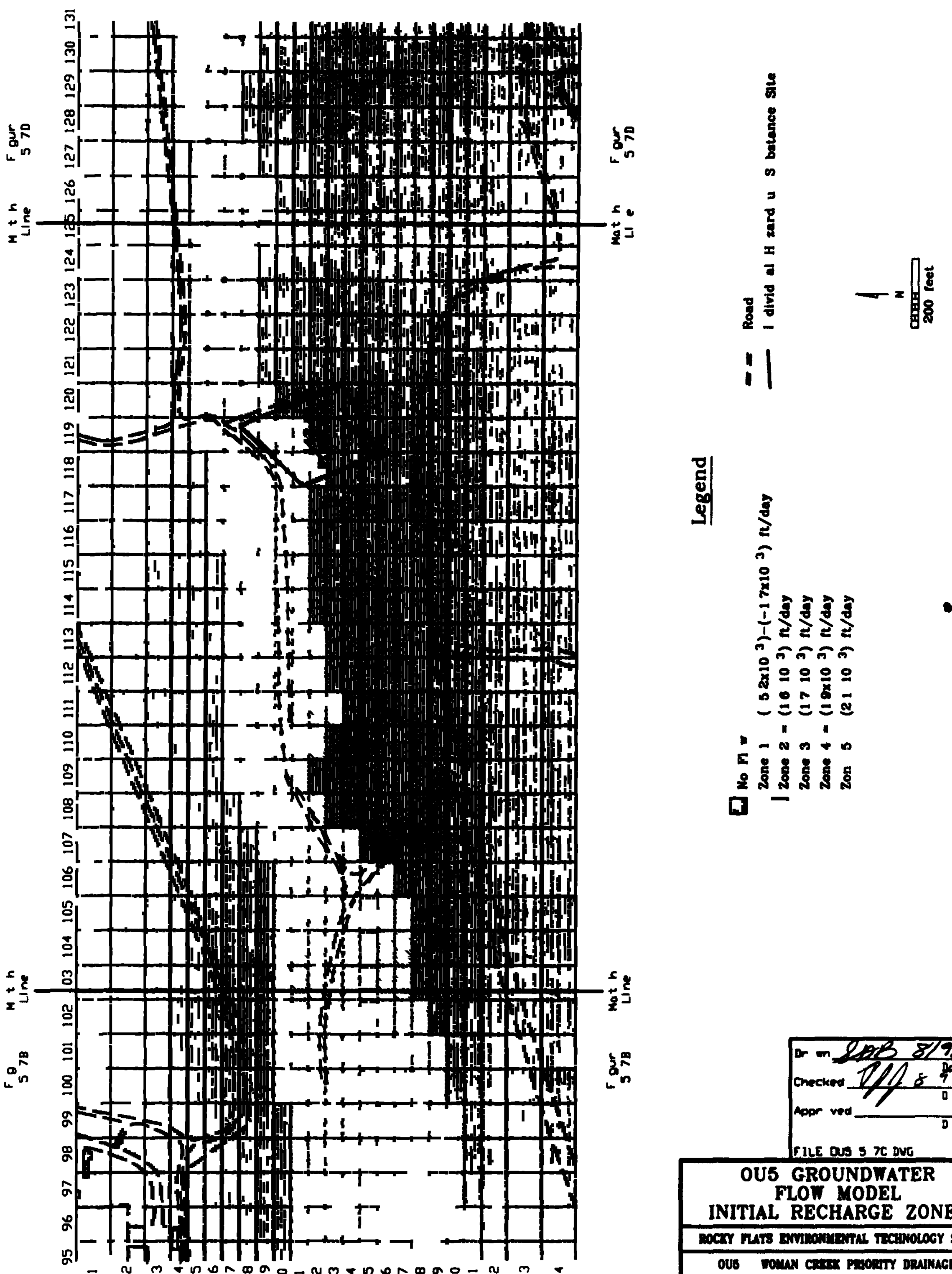
**OU5 GROUNDWATER FLOW MODEL INITIAL RECHARGE ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-7B

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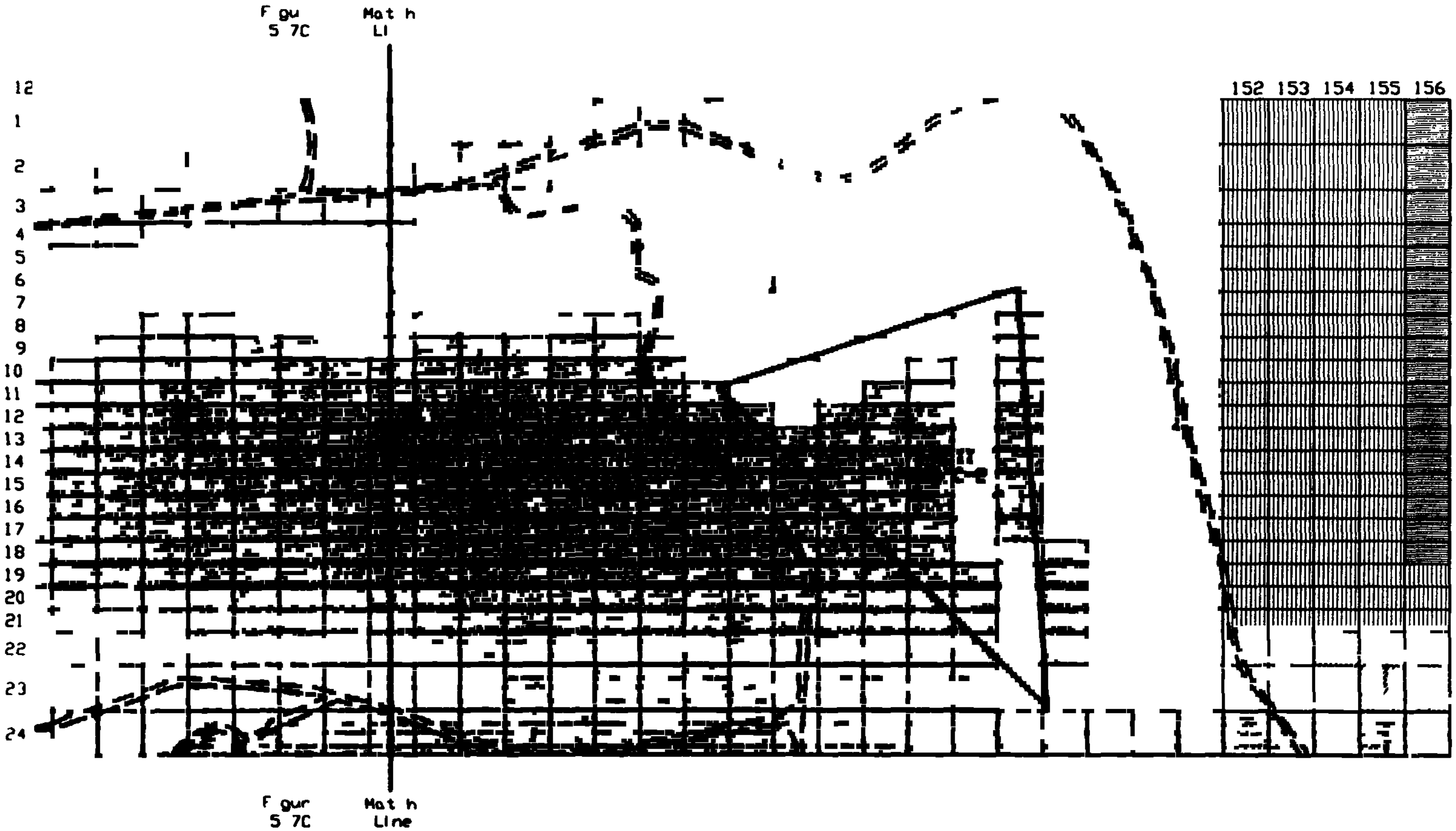
**OU5 GROUNDWATER FLOW MODEL INITIAL RECHARGE ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-7C




## Legend

No Flow
Zon 1 = (-5 2x10 $^{3}$)-( 1 7 10 $^{3}$) ft/day
Zone 2 = (1 6 10 $^{3}$) ft/day
Zon 3 = (1 7 10 $^{3}$) ft/day
Zon 4 (1 9x10 $^{3}$) ft/day
Zone 5 (2 1 10 $^{3}$) ft/day

Road
Individu l H zard u S bstance Site

N
200 feet

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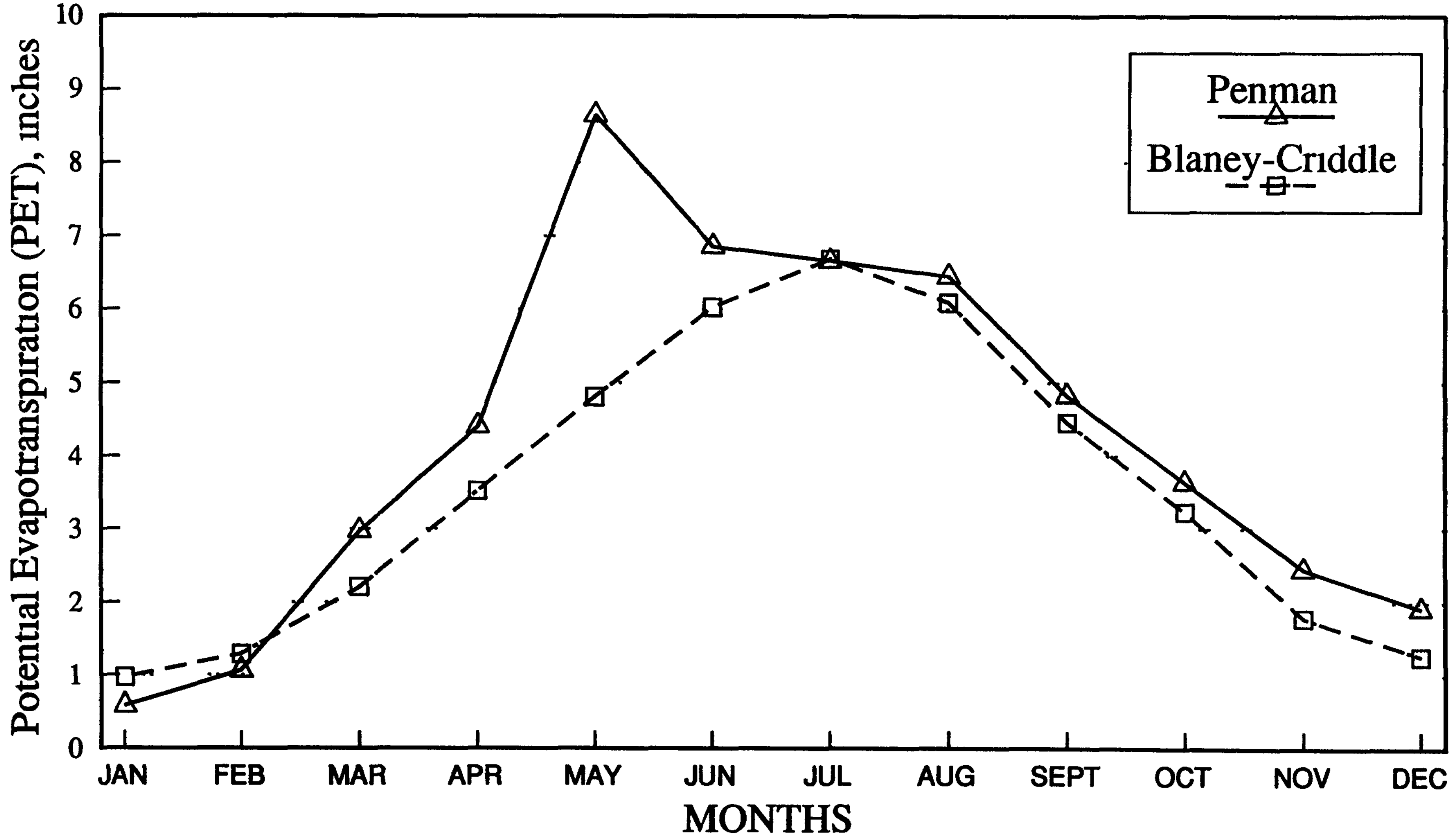
**OU5 GROUNDWATER FLOW MODEL INITIAL RECHARGE ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-7D

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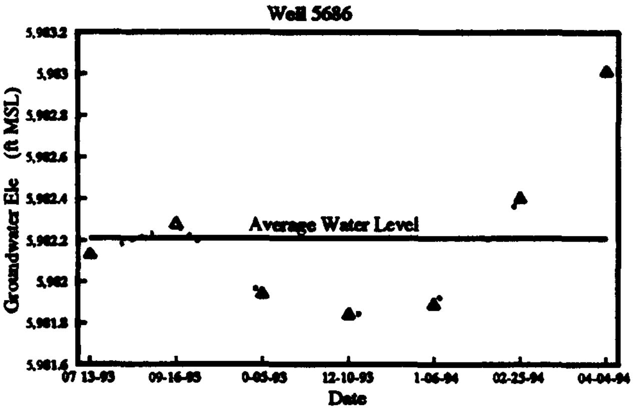
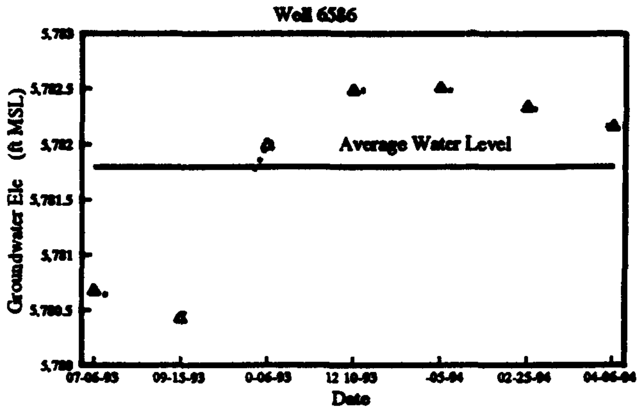
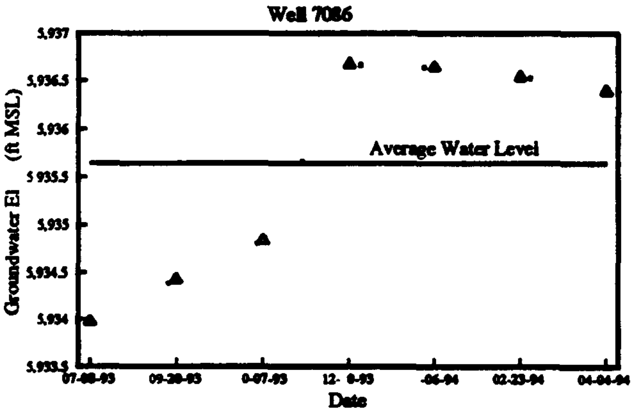
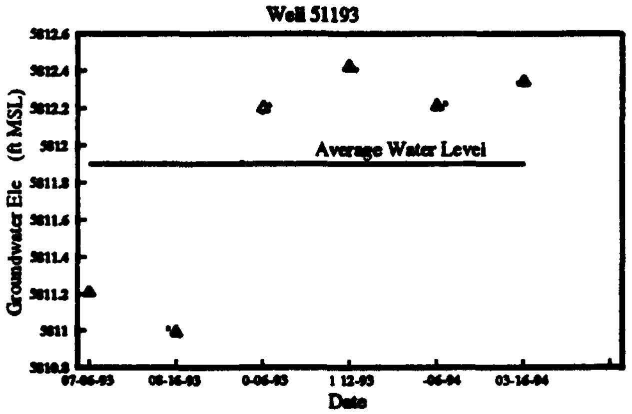
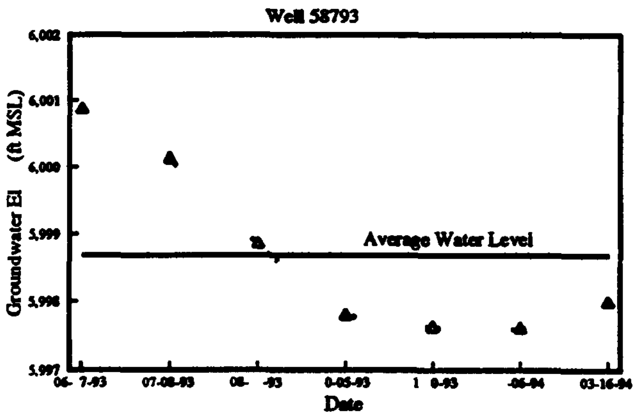
| | RFI/RI REPORT |
| | FIGURE 5-8 |

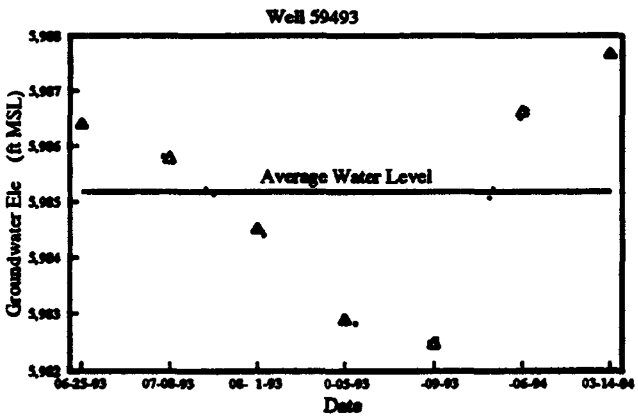


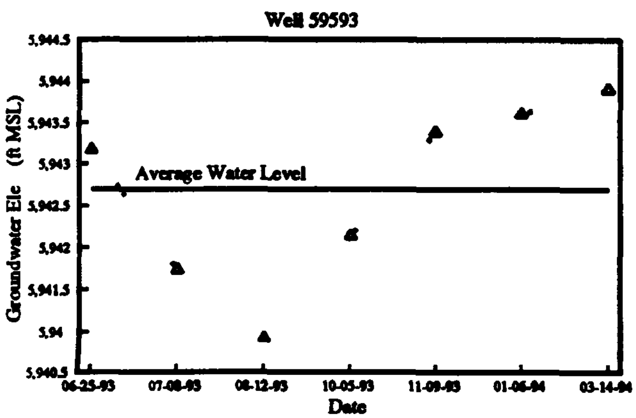




**EXPLANATION**

Measured Groundwater Elevation.

HYDROGRAPHS
OF
TARGET WELLS

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

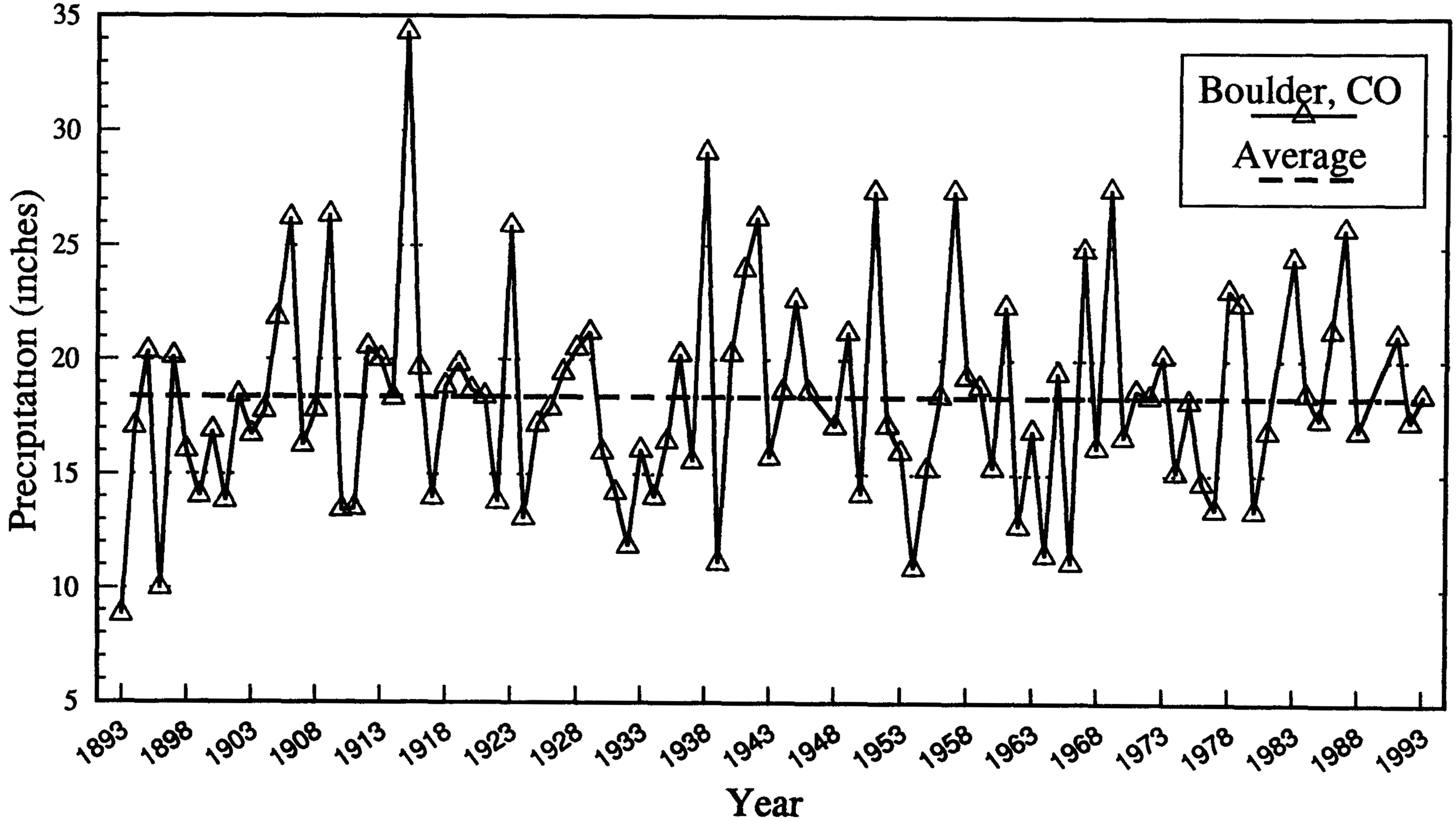
FIGURE 5-9

DRAWN 7/27/95 DATE

CHECKED 7/27/95 DATE

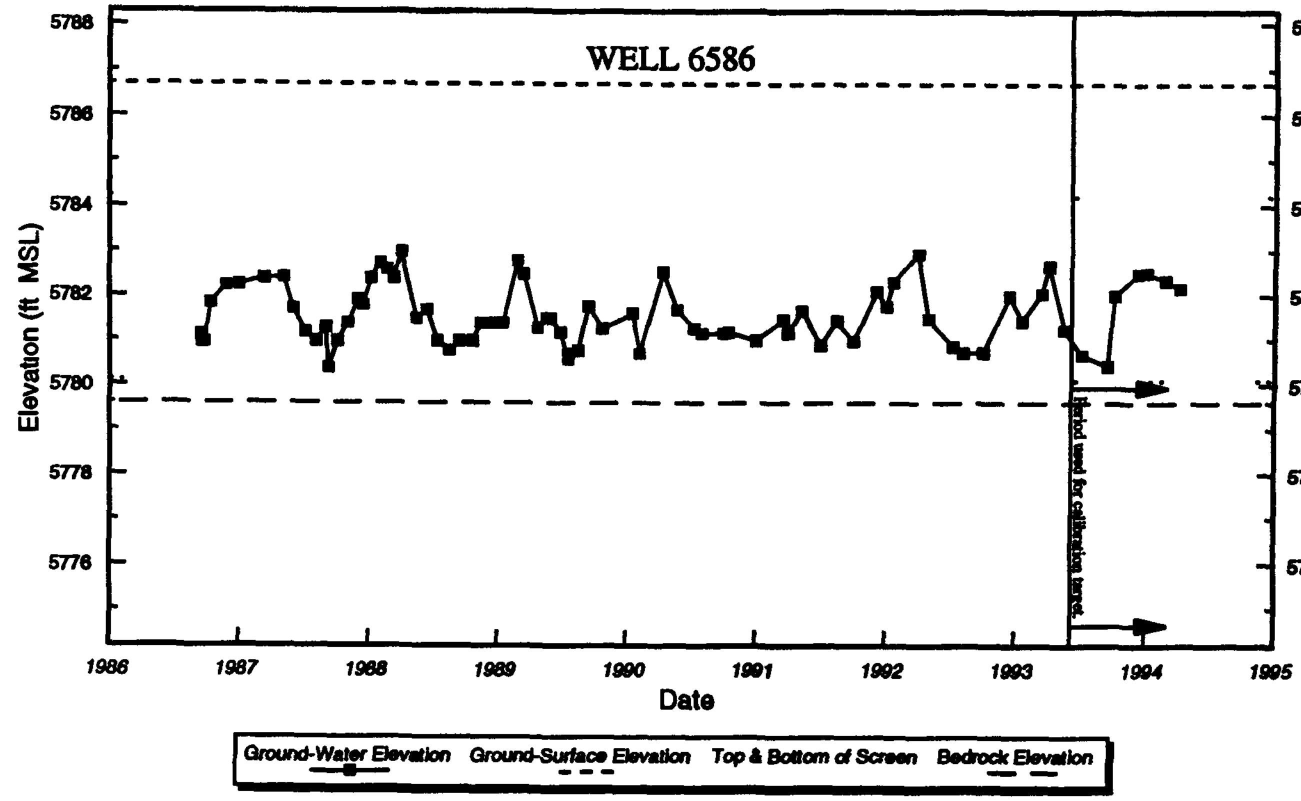
APPROVED DATE

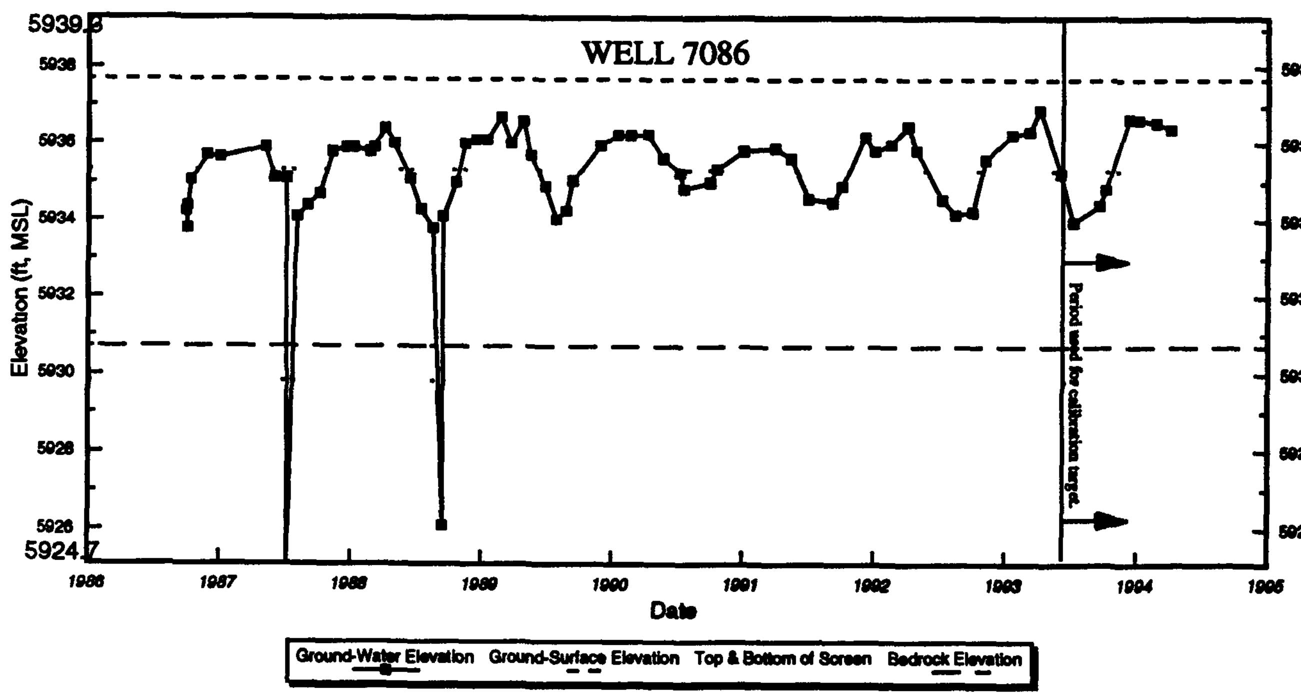
F5-9.DRW




NOTE Average Precipitation at Boulder CO is 18 38 inches

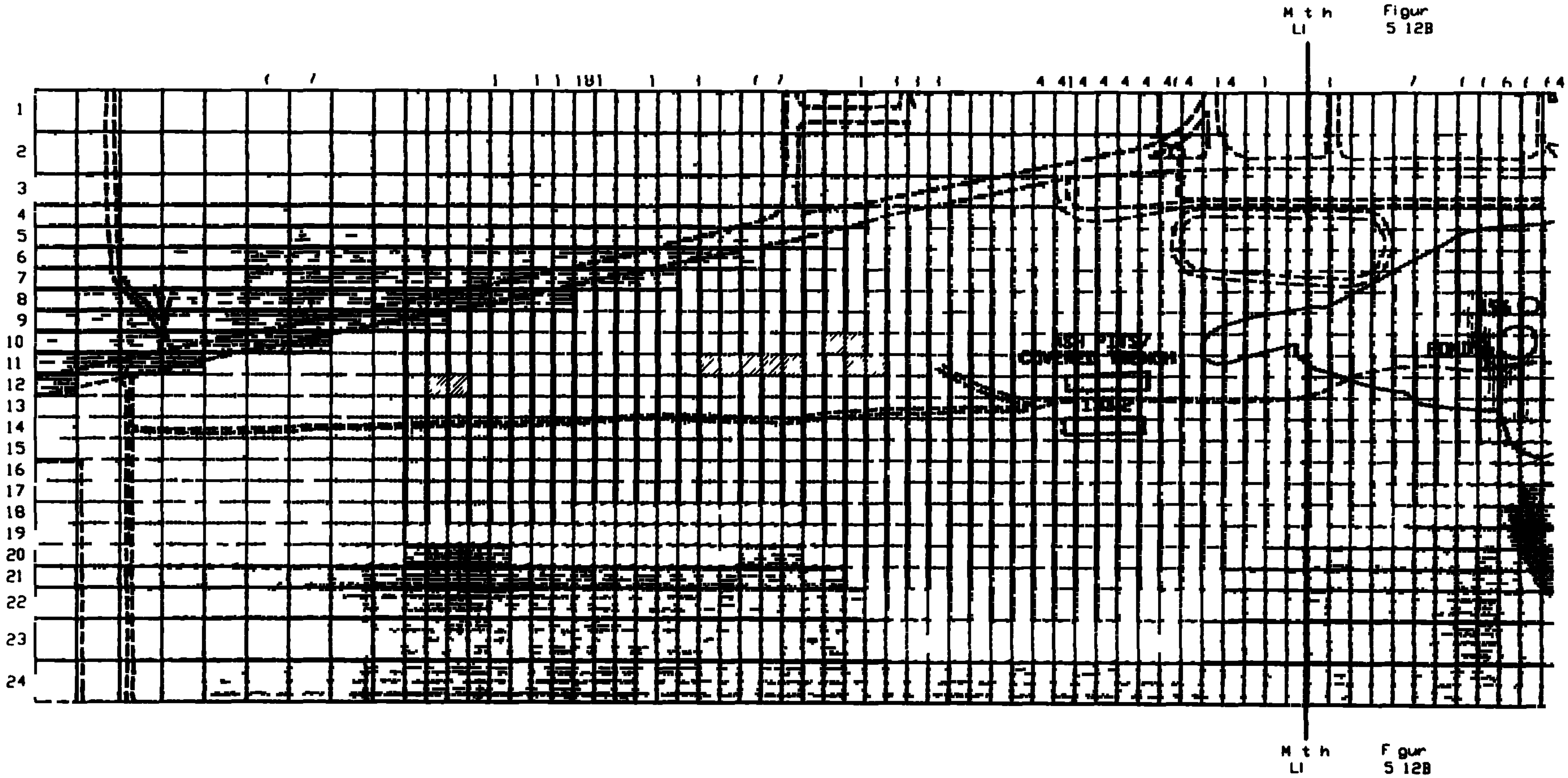
| | |
|---|---|
| | PRECIPITATION AT BOULDER, COLORADO |
| DRAWN [signature] DATE | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| CHECKED JWH 10/3/95 DATE | OU5 WOMAN CREEK PRIORITY DRAINAGE |
| APPROVED [signature] DATE | RFI/RI REPORT |
| | FIGURE 5-10 |




NOTES The top and bottom lines of these hydrographs indicate the top of well casing and bottom of well elevations, respectively
Elevations plotted at Bottom of Well" indicate a DRY" condition.

| | |
|---|---|
| | HYDROGRAPHS OF WELLS 6586 AND 7086 |
| DRAWN JOY 7/27/95 DATE | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| CHECKED DATE | OU5 WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| APPROVED DATE | FIGURE 5-11 |
| F5-11.DRW | |




## Legend

- N Flow
- Zone 1 = 01 01 ft/day
- Zone 2 01 - 1 ft/day
- Zone 3 = 1 10 ft/day
- Road
- Individual Hazard us Substance Site

N

200 feet

Dr wn SAB 8/7/95 Date

Check d PJJ 8 9 95 D t

Approved _______ Dat

FILE OU5 512A DWG

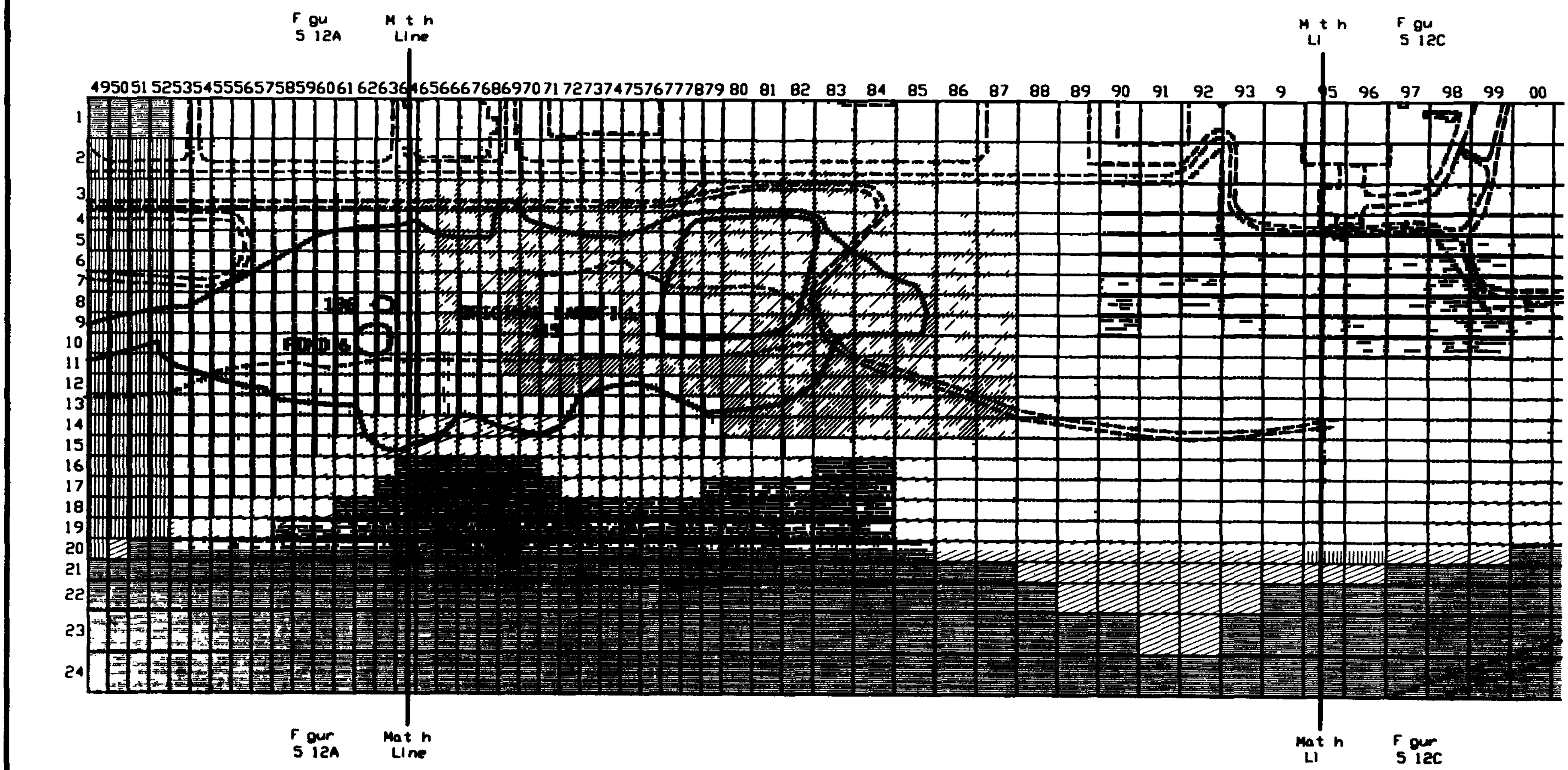
**OU5 GROUNDWATER FLOW MODEL CALIBRATED HYDRAULIC CONDUCTIVITY ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-12A




## Legend

- N Flow
- Zone 1 = 01 - 01 ft/day
- Zo 2 01 1 ft/day
- Zone 3 = 1 - 10 ft/day
- Road
- Individu l Hazardous S bstan Sit

N

200 feet

| | |
|---|---|
| Dr wn | SAB 8/9/95 |
| | Date |
| Checked | 8-9-95 |
| | Da |
| Approved | |
| | D t |
| FILE OU5 512B.DWG | |

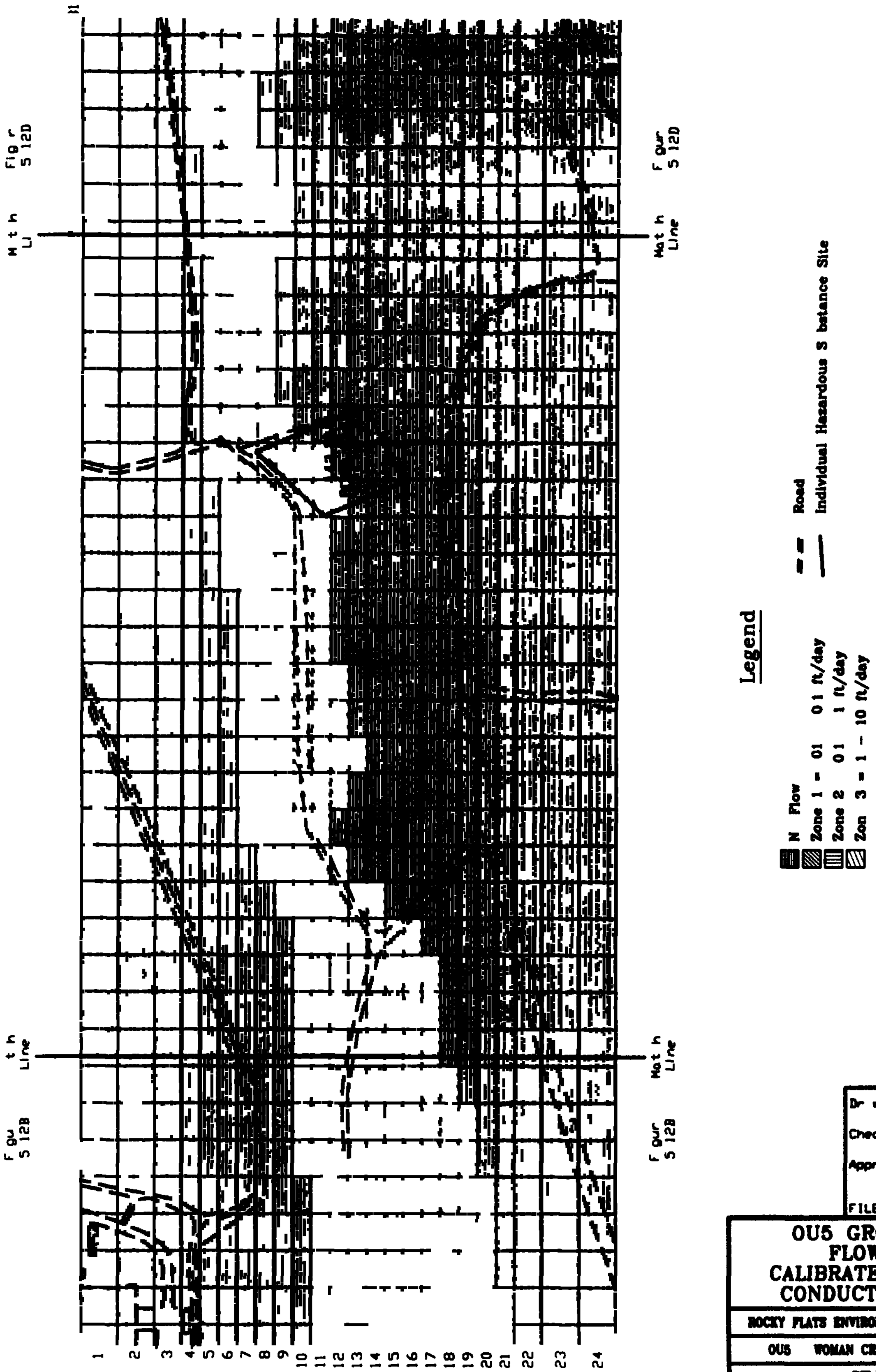
**OU5 GROUNDWATER FLOW MODEL CALIBRATED HYDRAULIC CONDUCTIVITY ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-12B




Drawn IAB 8/9/95
Date
Checked TCJ 8/9/95
Date
Approved
Date

FILE OU5 512C.DWG

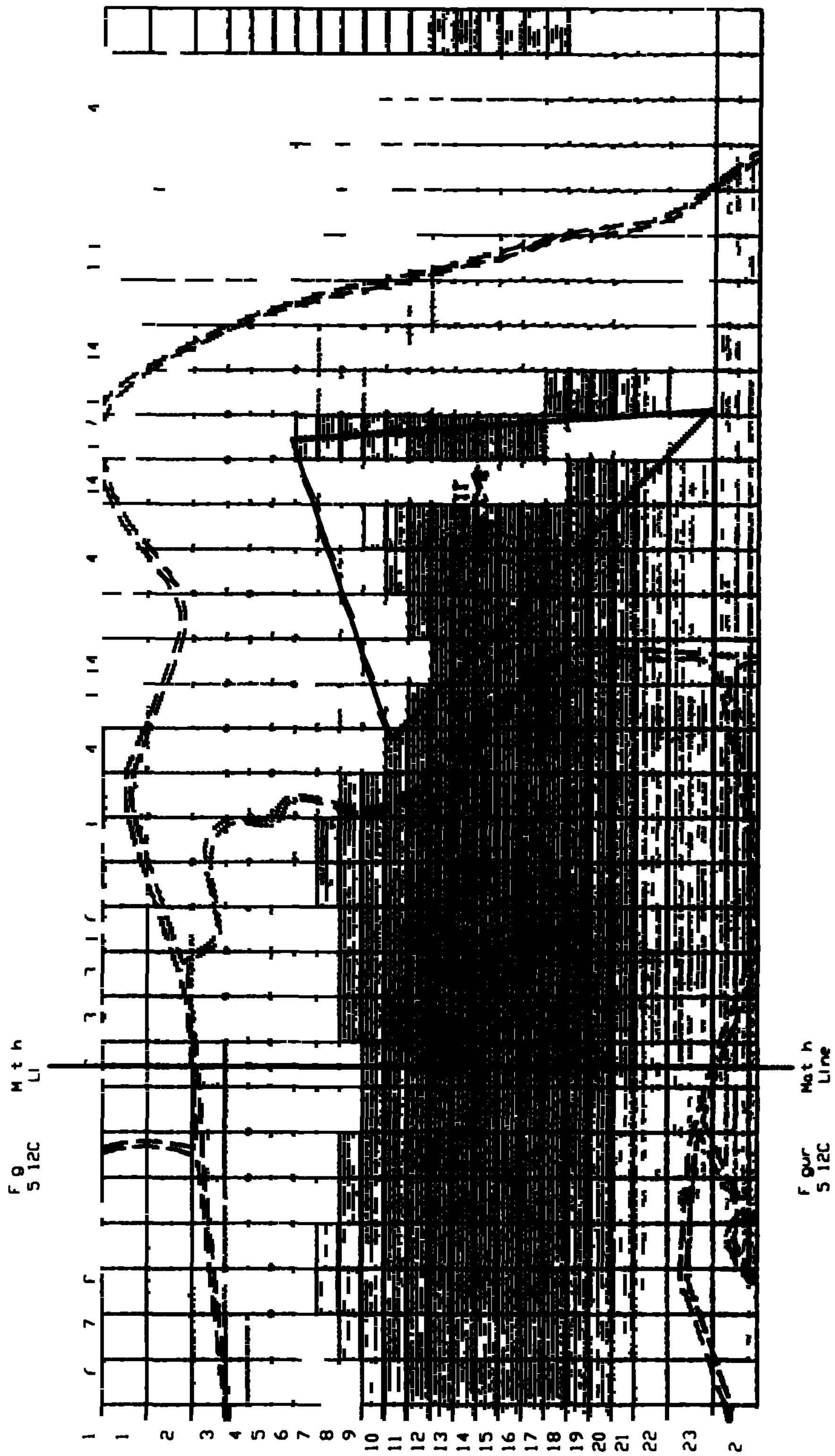
**OU5 GROUNDWATER FLOW MODEL CALIBRATED HYDRAULIC CONDUCTIVITY ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-12C




## Legend

- N Flow
- Zone 1 01 - 01 ft/day
- Zone 2 01 - 1 ft/day
- Zone 3 1 - 10 ft/day
- Zone 4 = 10 - 100 ft/day

- Road
- Individual Hazard us Substance Site

N
200 feet

Dr wn ~~JAB~~ 8/9/95
Date
Checked ~~PE~~ 8/9/95
Dat
Approved
Dat
FILE OU5 512D.DWG

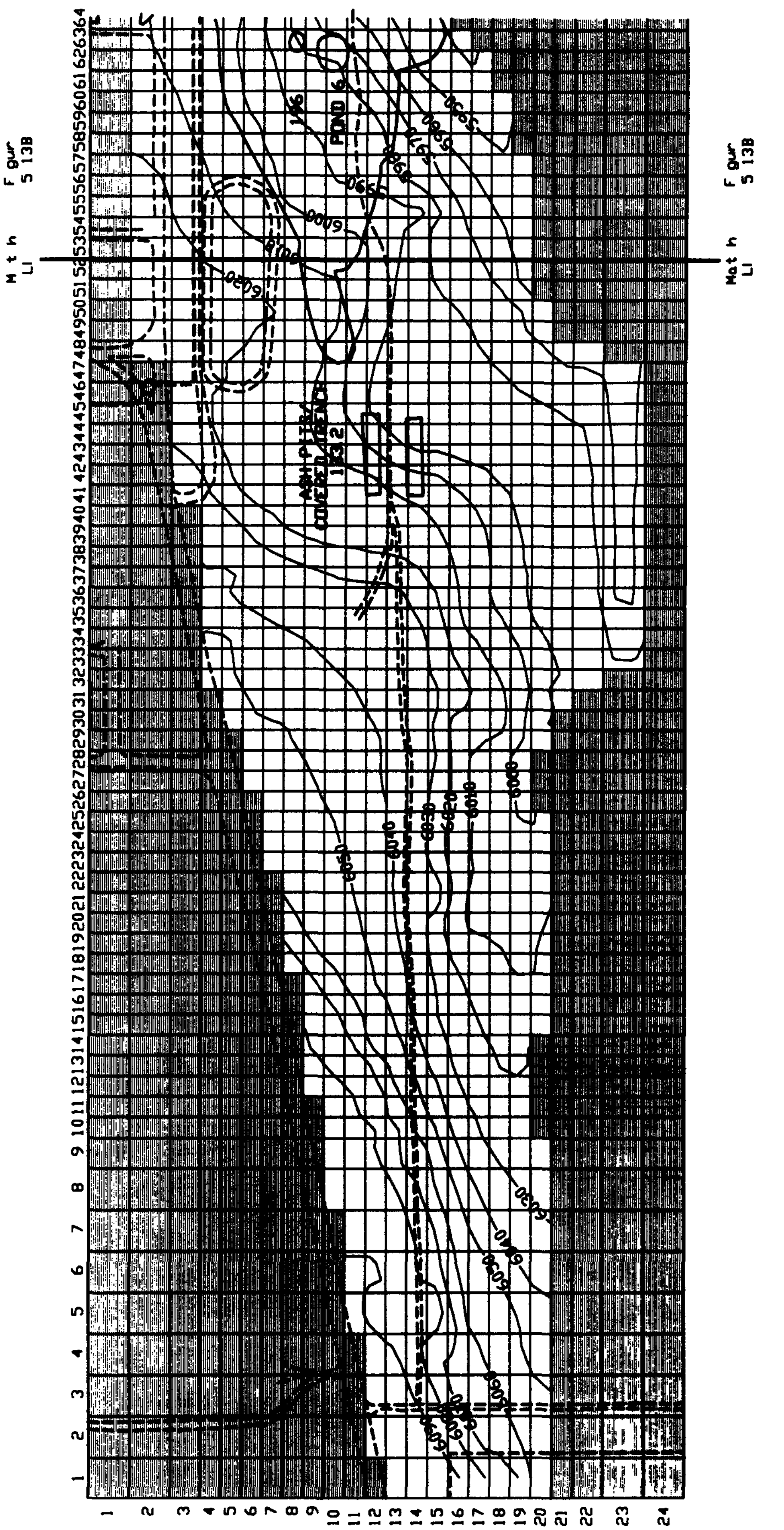
**OU5 GROUNDWATER FLOW MODEL CALIBRATED HYDRAULIC CONDUCTIVITY ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-12D




Legend

No Fl

Bedrock El t on Contour 10

Road

Indi dual Ha dou Sub t nc S t

N

200 f t

Dr wn 8/9/95

Checked

Appr ved

FILE OU5 513A DWG

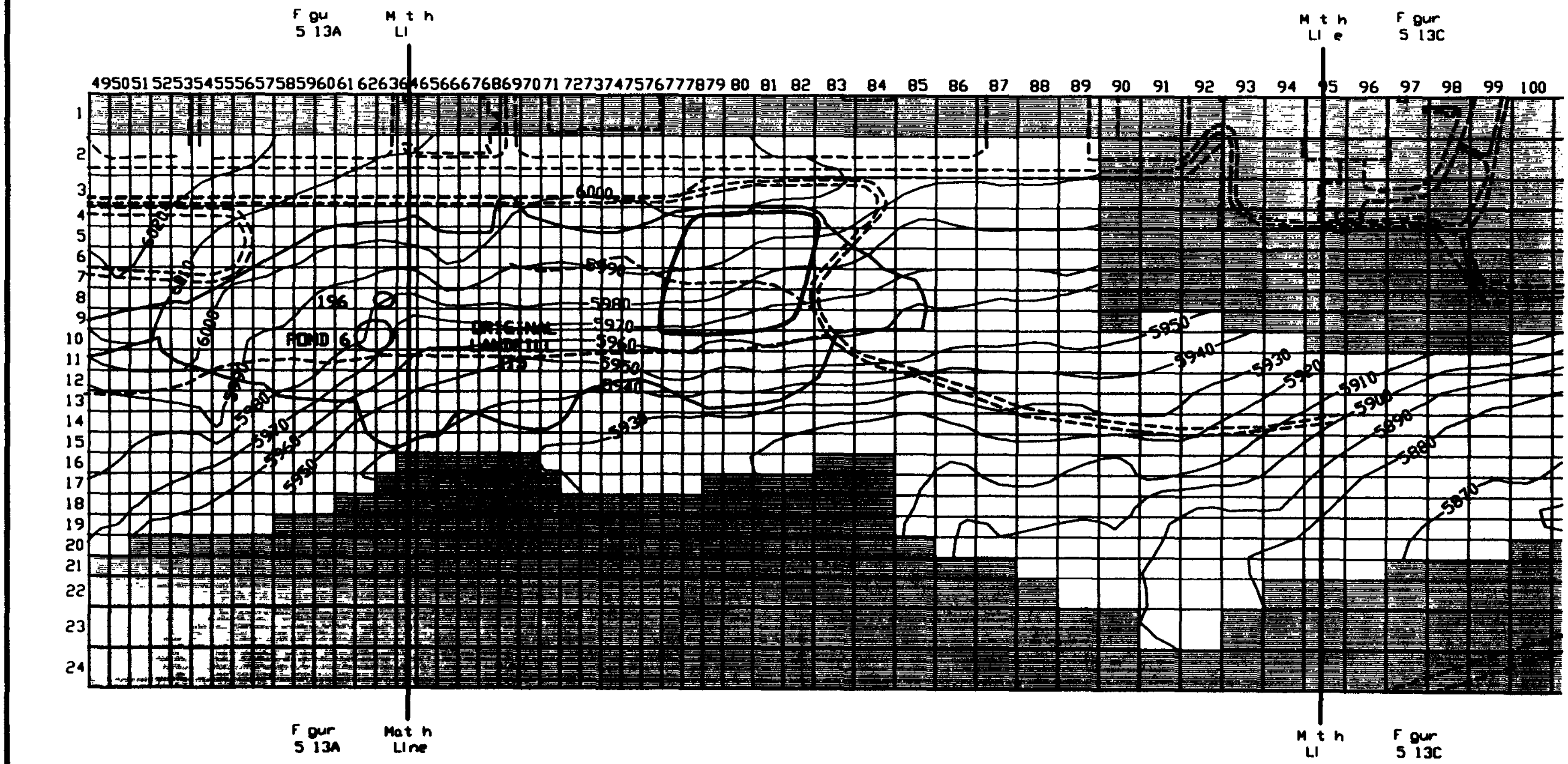
**OU5 GROUNDWATER FLOW MODEL BEDROCK ELEVATIONS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-13A




## Legend

No Flow

Bedrock Elev tio Contou 10

Road

Individual Hazard us S bstan Site

N

200 feet

Drawn SKB 8/2/95
Checked TZ7 8/9/95
Appro ed
FILE OU5 513B.DWG

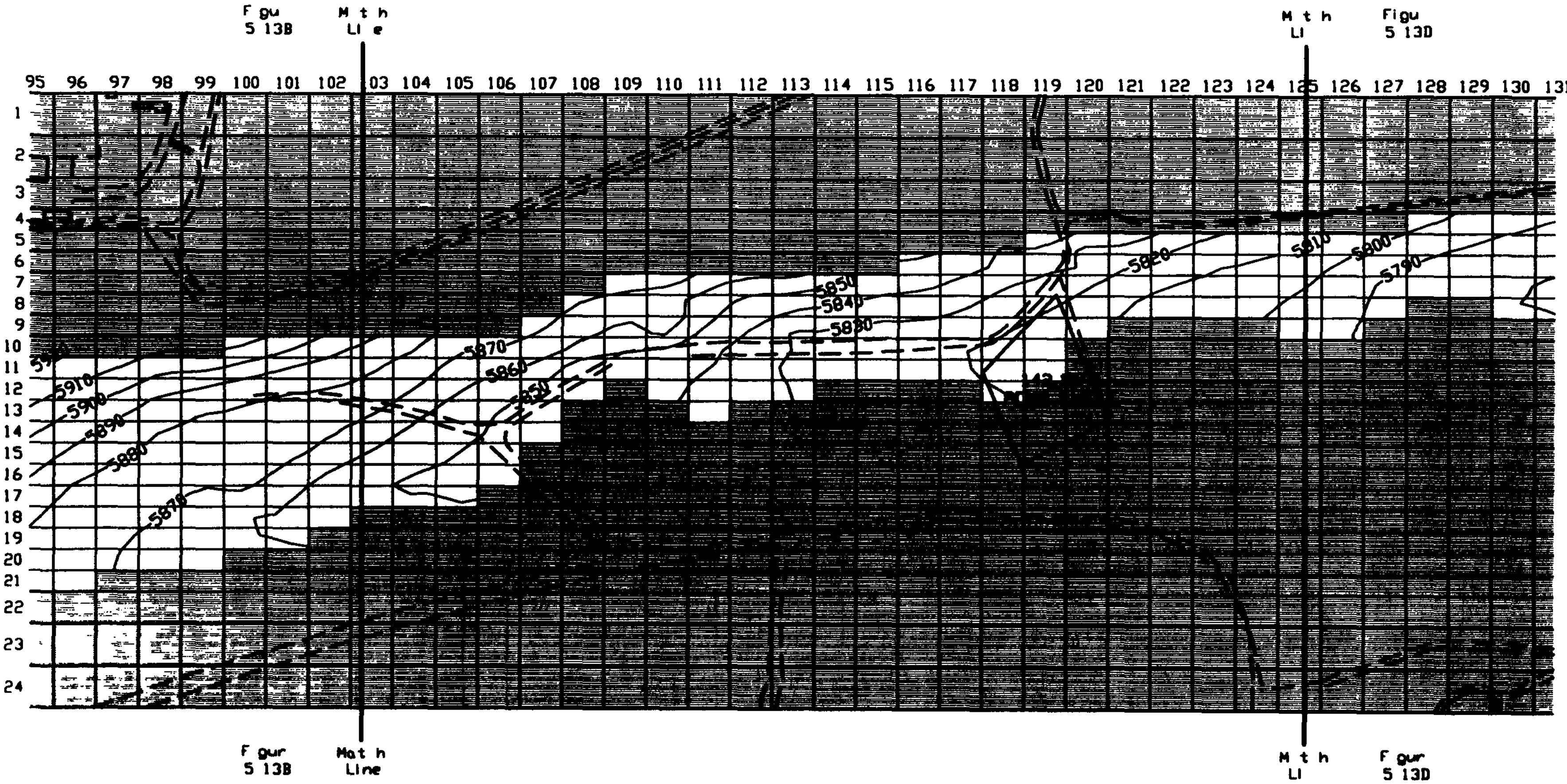
**OU5 GROUNDWATER FLOW MODEL BEDROCK ELEVATIONS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-13B




## Legend

No Flow

Bedrock Elev tio Co to 10

Road

Individu l Hazard us Substa ce Site

N

200 feet

Dr wn LAB 8/9/95 Date

Checked [illegible] Dt

Approved Dat

FILE OU5 513C DWG

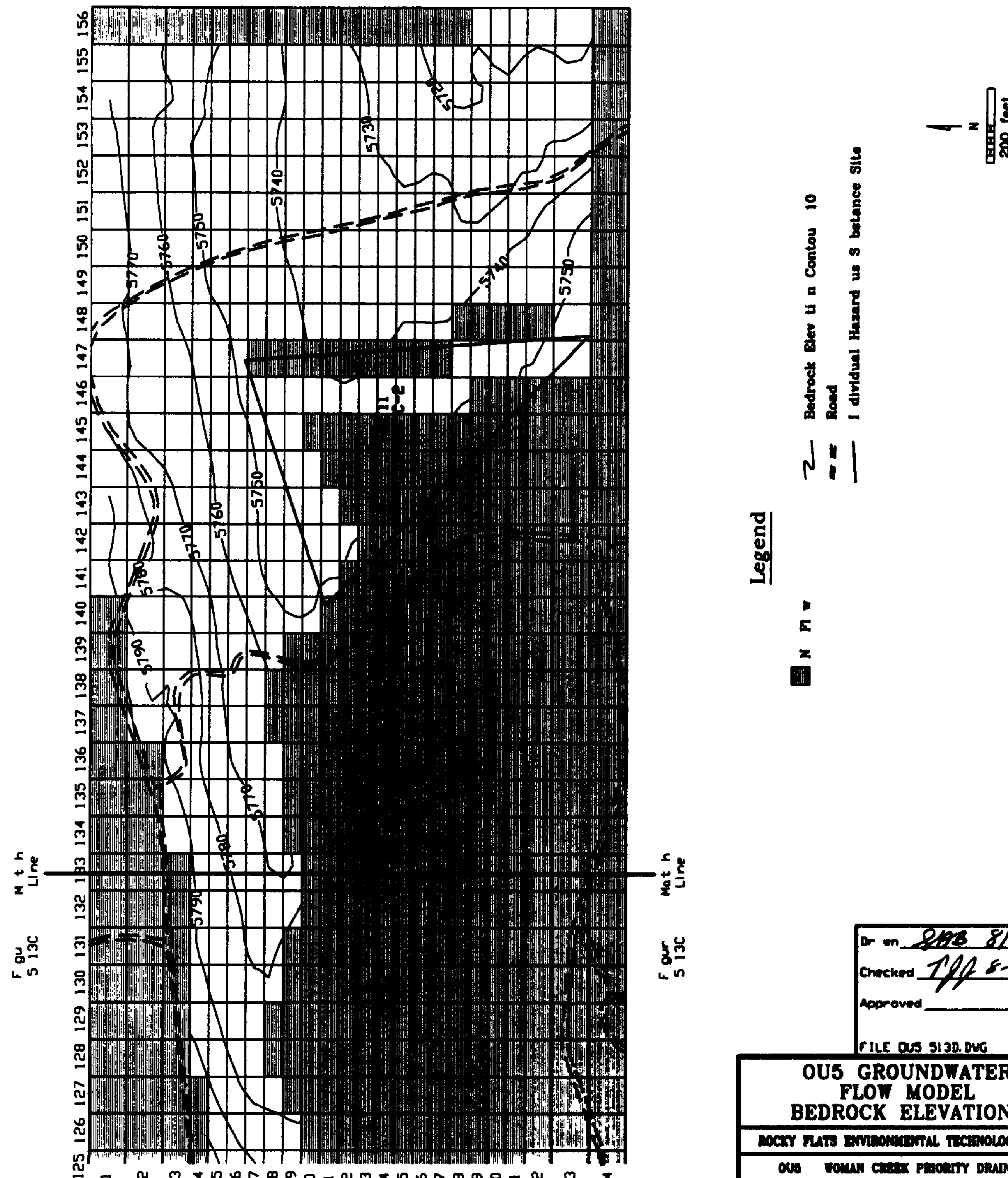
**OU5 GROUNDWATER FLOW MODEL BEDROCK ELEVATIONS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-13C




Dr wn SMB 8/9/95
Dat
Checked TJJ 8-9-95
Da
Approved
Dat
FILE OU5 513D.DWG

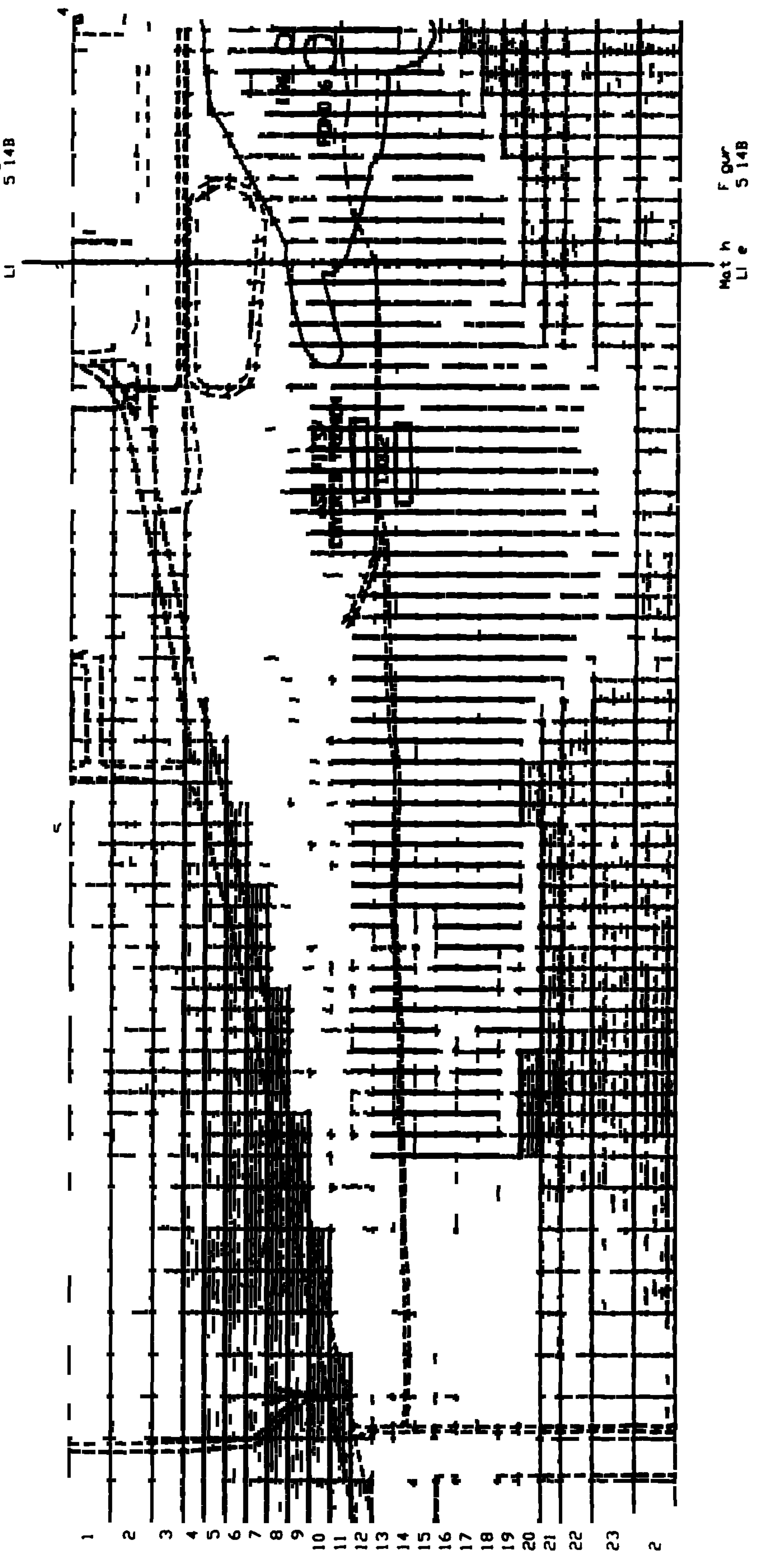
**OU5 GROUNDWATER FLOW MODEL BEDROCK ELEVATIONS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-13D




## Legend

- N Flow
- Zone 1 ( 7 4286 10 4) ( 2 4286 10 ) ft/day
- Zone 2 (2 2857x10 4) ft/day
- Zon 3 (2 4286x10 ) ft/day
- Zone 4 (2 7143x10 4) ft/day
- Zone 5 (3 0x10 ) ft/day
- Road
- Individ l Hazard e S bstanc Site

N

200 feet

Dr wn SDB 8/9/95 Date

Checked JJJ 8 9 95 Dat

Approved ________ Dat

FILE OU5 514A DWG

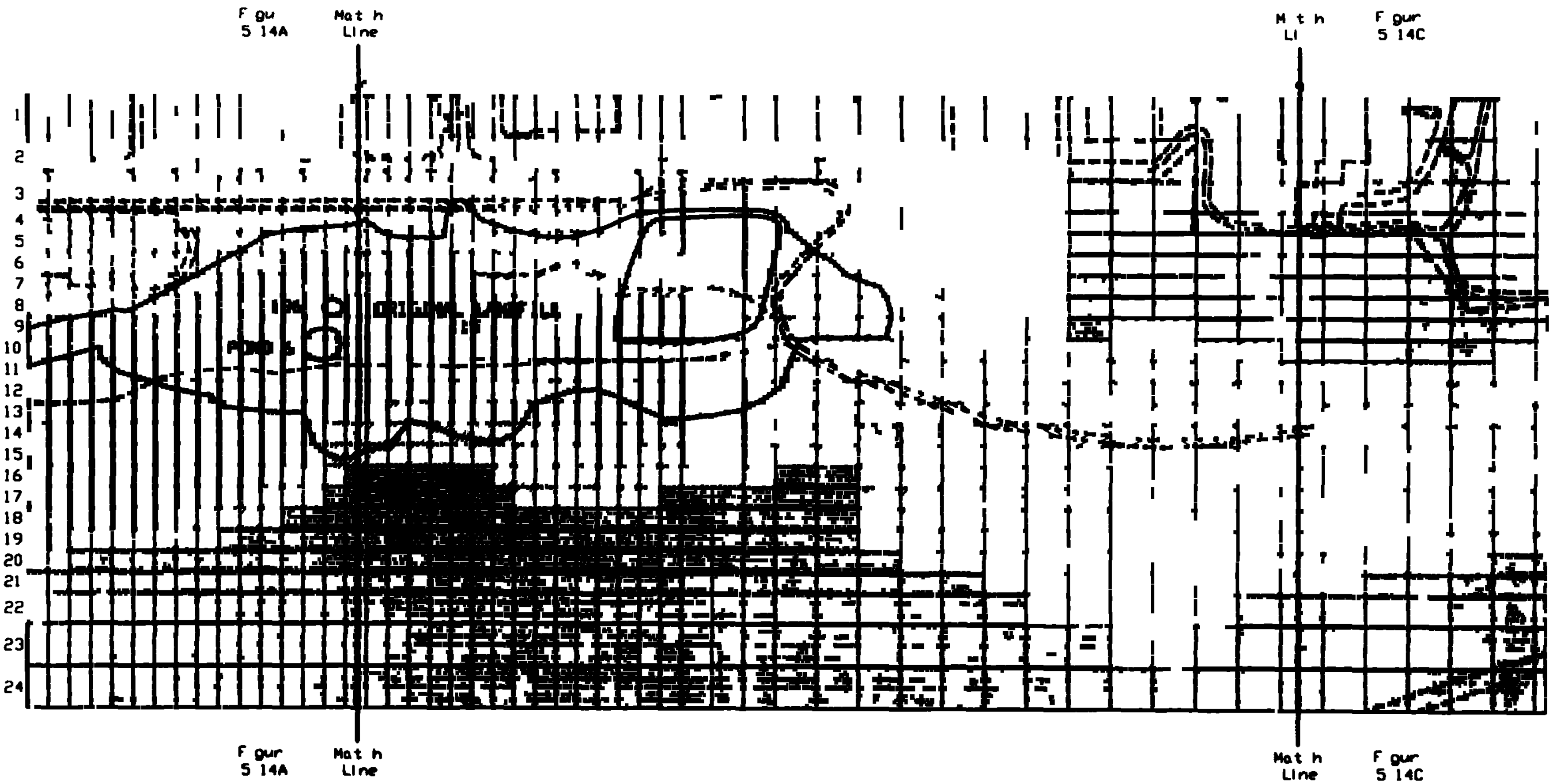
# OU5 GROUNDWATER FLOW MODEL CALIBRATED RECHARGE ZONES

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-14A




## Legend

- No Fl w
- Zon 1 = ( 7 4286 10 )-( 2 4286x10 $^{4}$) ft/day
- Zone 2 = (2.2857x10 ) ft/day
- Zone 3 = (2 4286x10 $^{4}$) ft/day
- Zone 4 = (2 7143x10 ) ft/day
- Zon 5 = (3 0x10 $^{4}$) ft/day
- Road
- Indi id I H zard S bstance Site

N

200 feet

Dr wn *[illegible] 8/9/95*
Checked *[illegible] 8-9-95*
Approved
FILE OU5 51 B.DWG

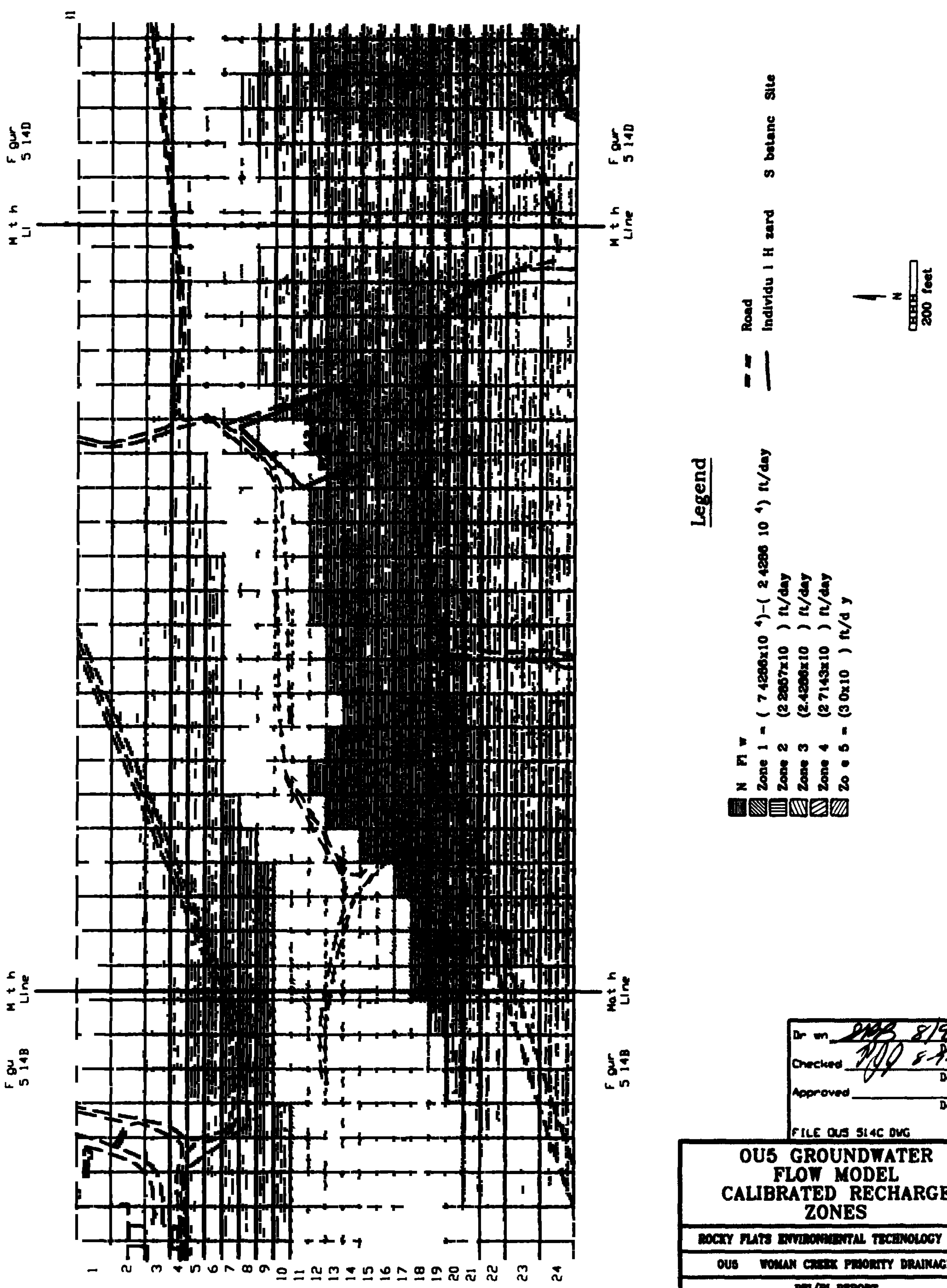
**OU5 GROUNDWATER FLOW MODEL CALIBRATED RECHARGE ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-14B




Dr wn 8/9/95

Checked 8-9-95 Date

Approved Dat

FILE OU5 514C DWG

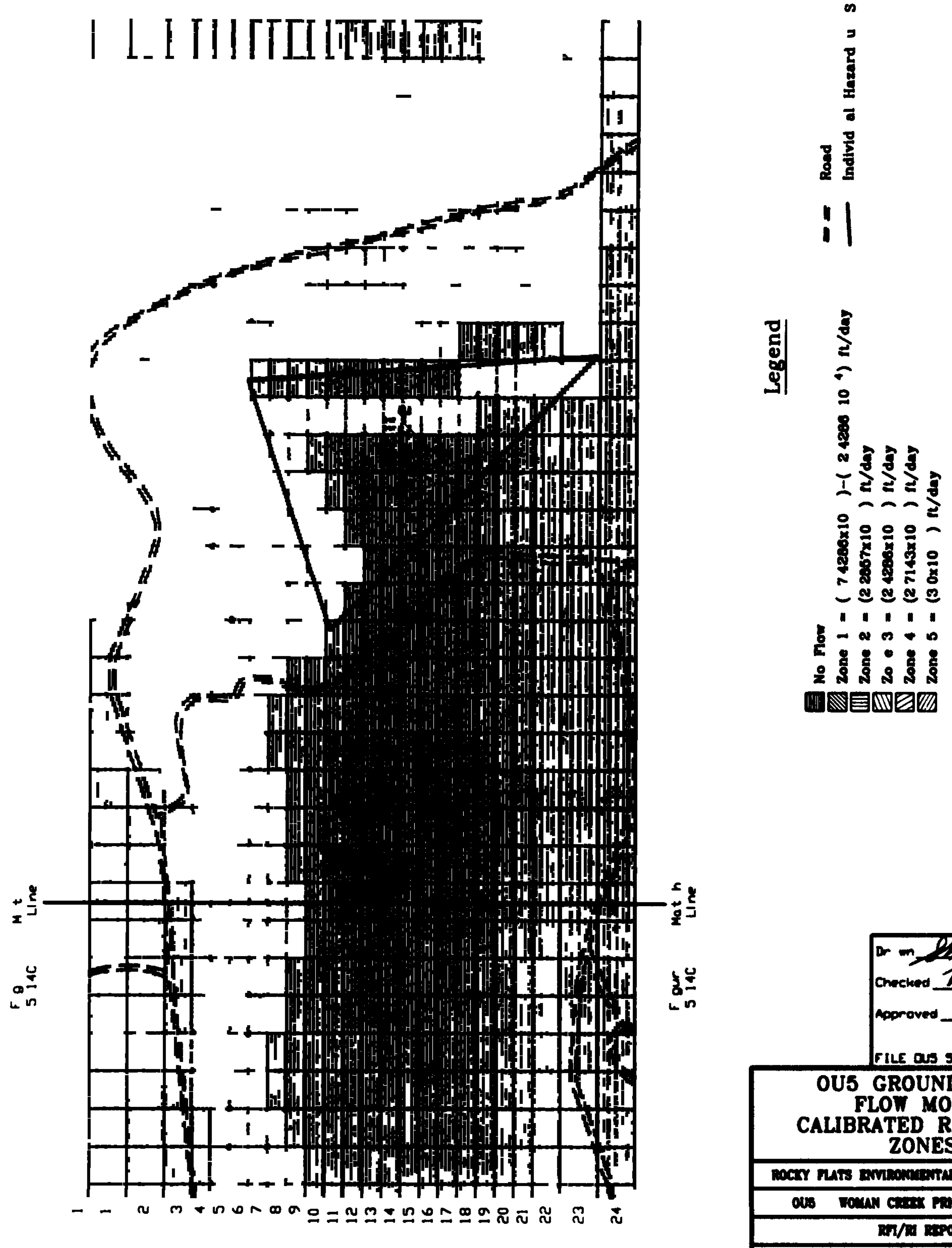
# OU5 GROUNDWATER FLOW MODEL CALIBRATED RECHARGE ZONES

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-14C




Drawn JMB 8/9/95
Checked 8-9-95
Date
Approved
Date
FILE OU5 514D.DWG

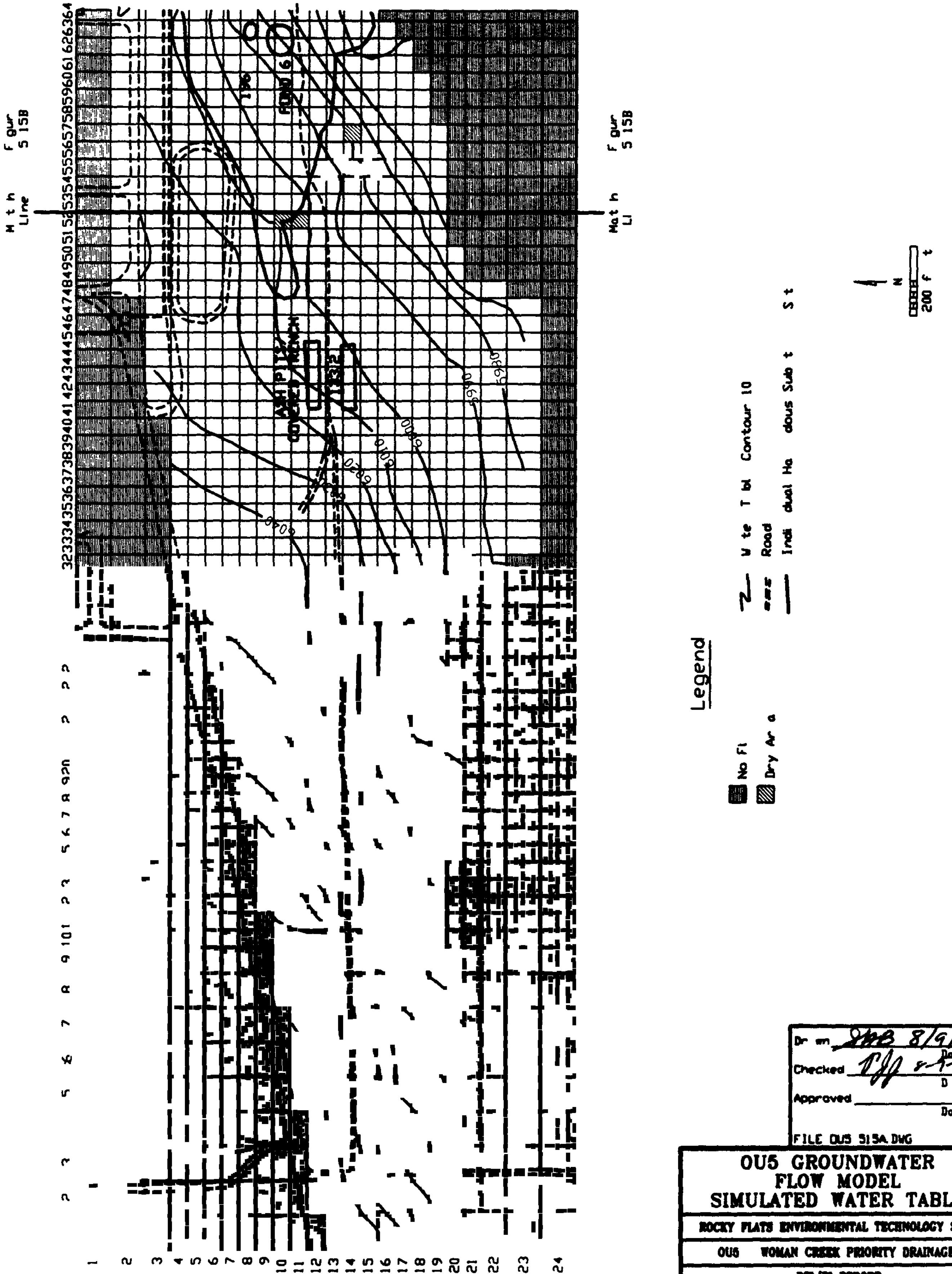
**OU5 GROUNDWATER FLOW MODEL CALIBRATED RECHARGE ZONES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-14D




Drawn JAB 8/9/95
Checked [illegible] 8-9-95
Approved

FILE OU5 515A.DWG

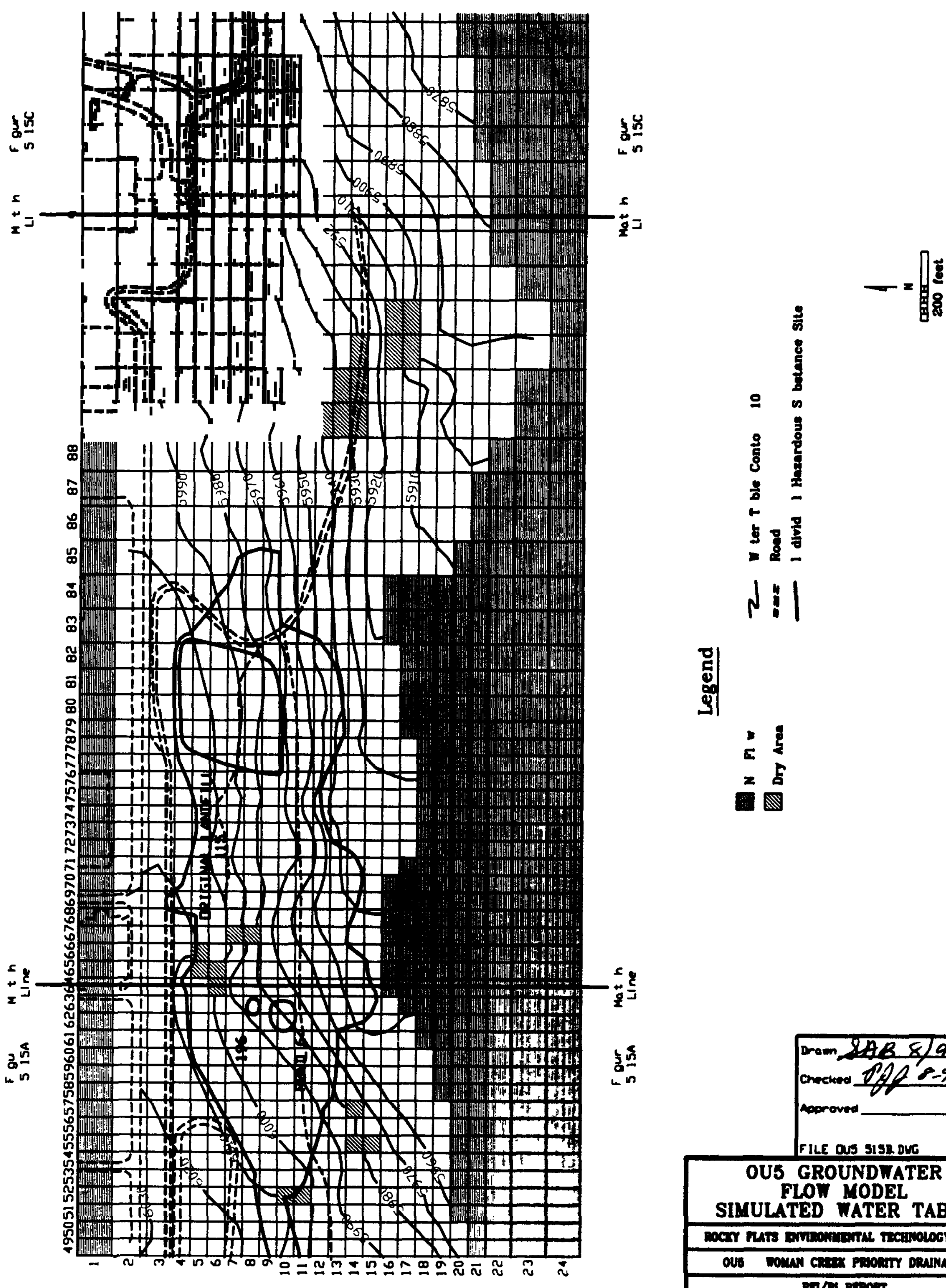
# OU5 GROUNDWATER FLOW MODEL SIMULATED WATER TABLE

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-15A




Drawn SAB 8/9/95

Checked PJJ 8-9-95 Date

Approved ______ Date

FILE OU5 515B.DWG

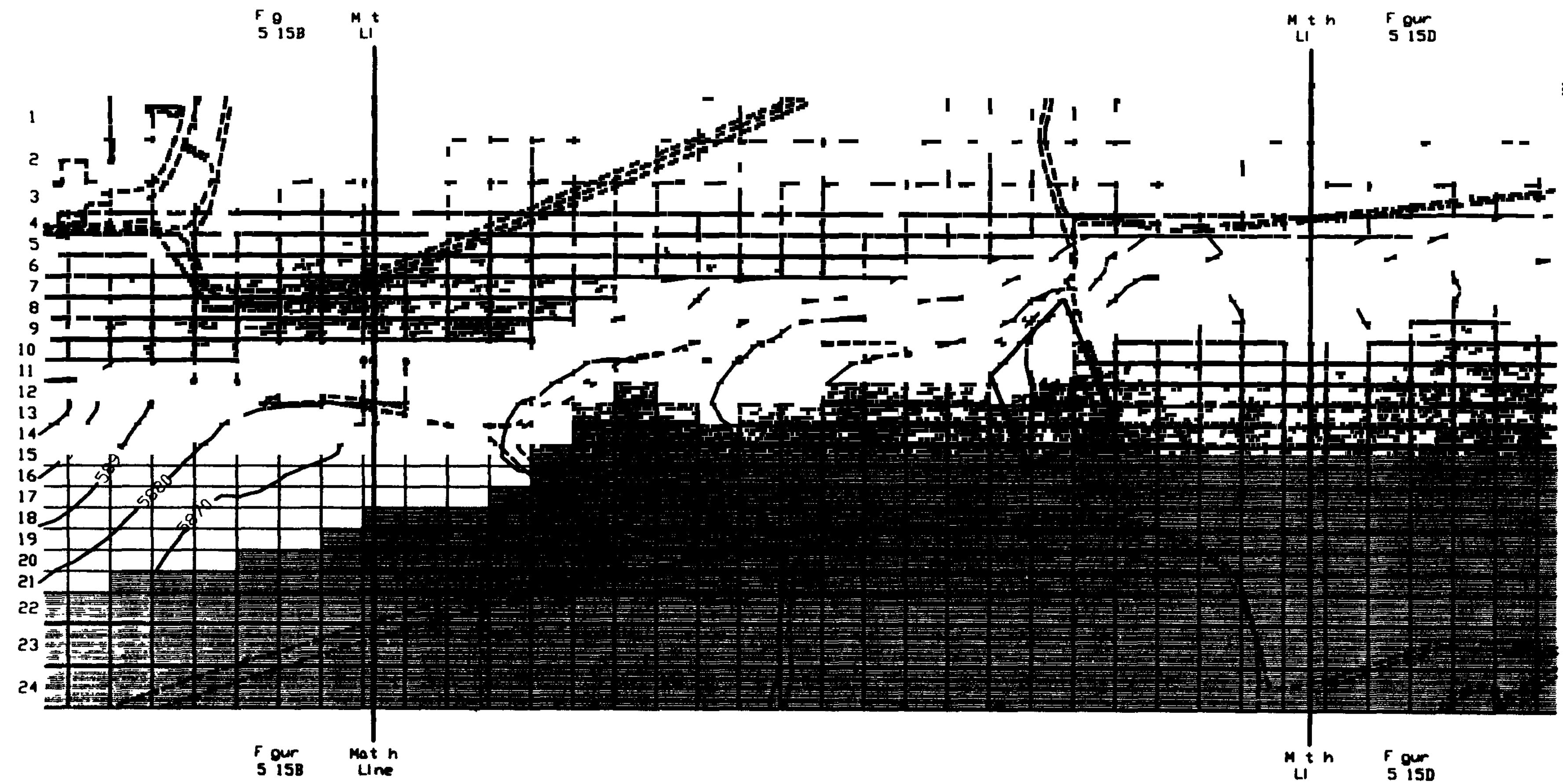
**OU5 GROUNDWATER FLOW MODEL SIMULATED WATER TABLE**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-15B




## Legend

N Flow

Dry Area

W ter T bl Conto 10

Road

Individual Hazardous Substance Site

N

200 feet

Dr wn NALL 8/9/95 Date

Checked [illegible] 8/9/95 Dat

Approved D

FILE OU5 515C.DWG

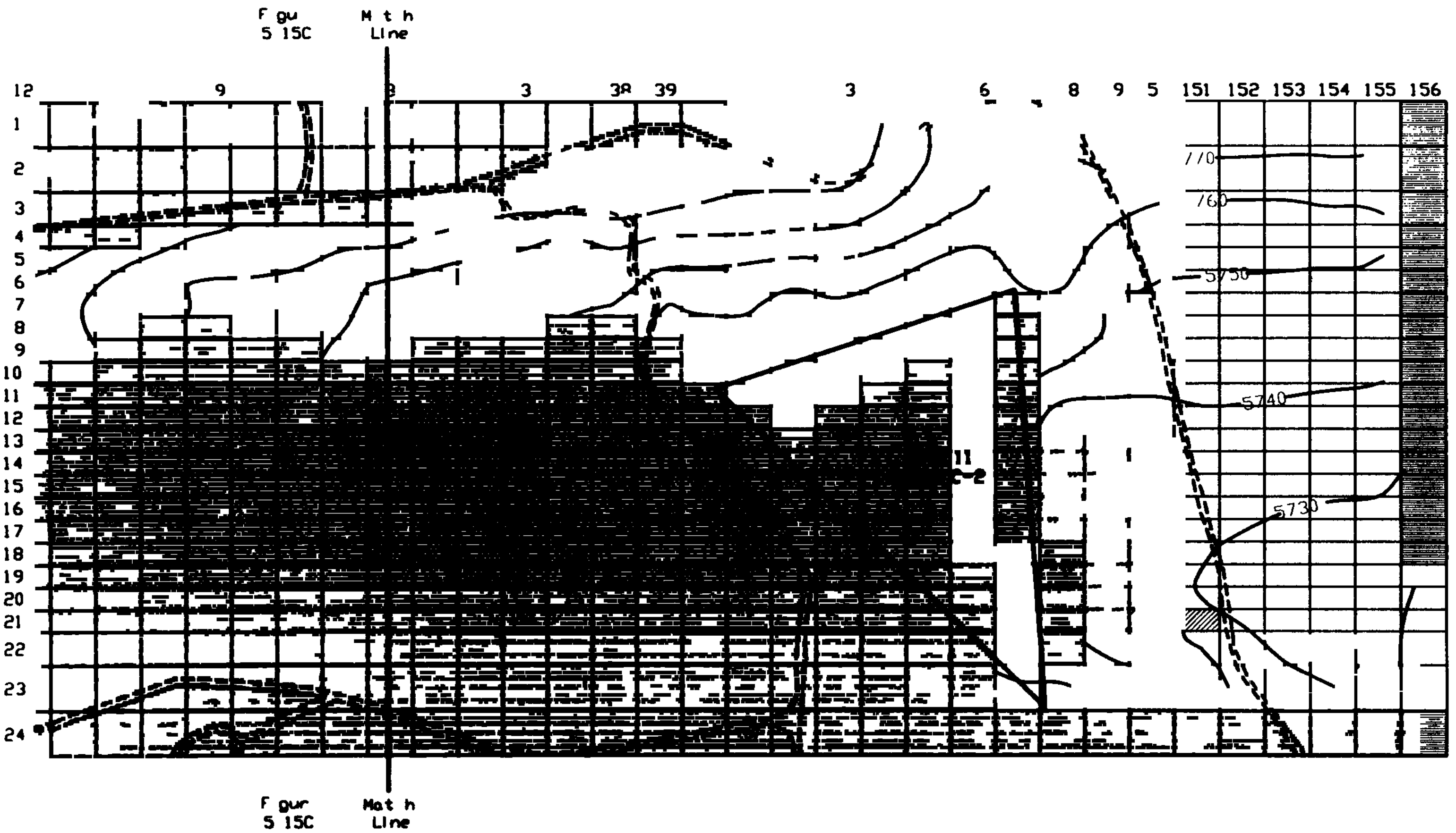
**OU5 GROUNDWATER FLOW MODEL SIMULATED WATER TABLE**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-15C




## Legend

N Flow
Dry Area
W ter T ble Conto 10
Road
Individ l Hazardous S bstance Site

Drawn NAU 8/9/95
Checked 7/27 8/9/95 Dat
Approved Dat
FILE OU5 515D.DWG

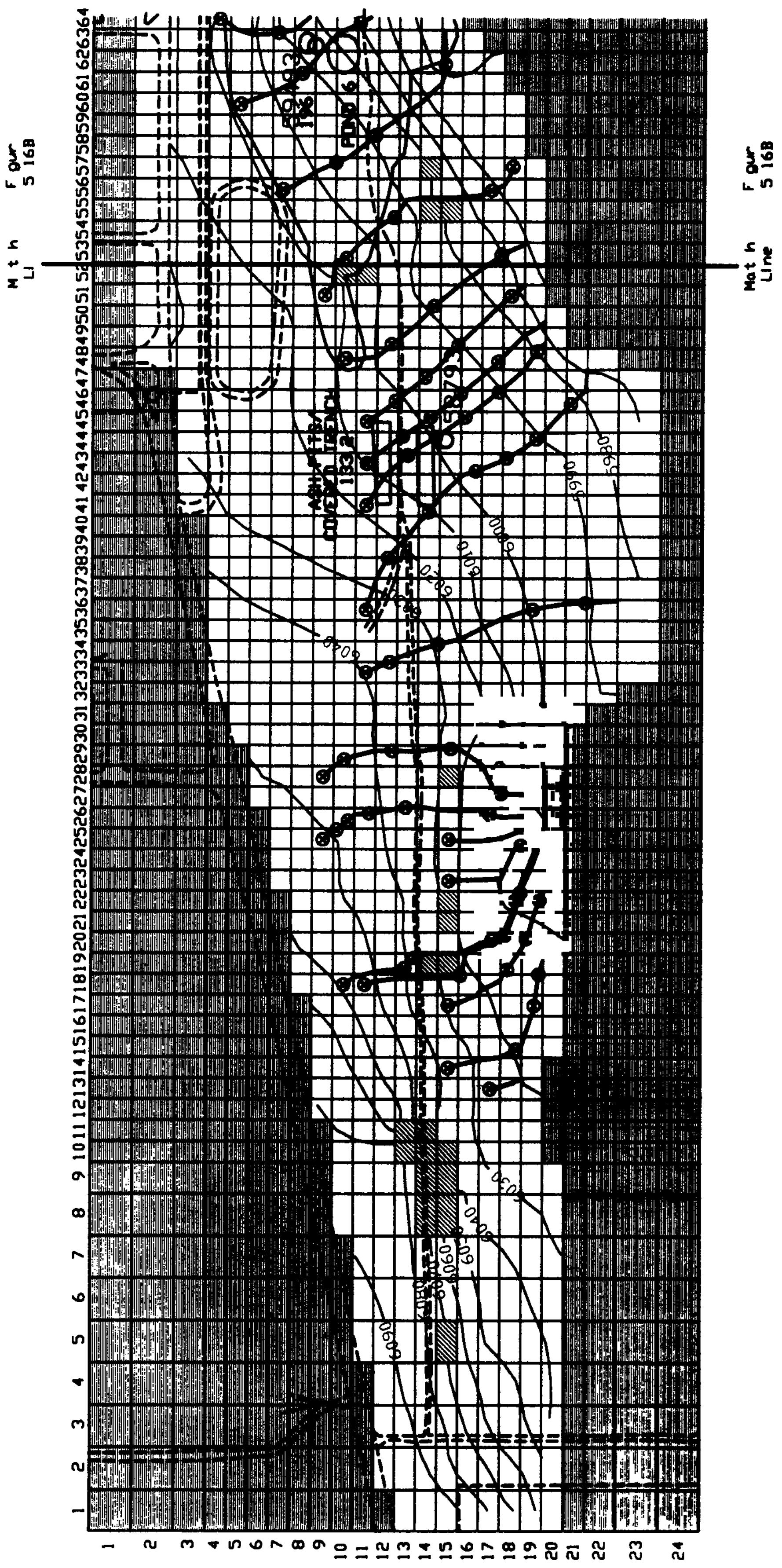
**OU5 GROUNDWATER FLOW MODEL SIMULATED WATER TABLE**

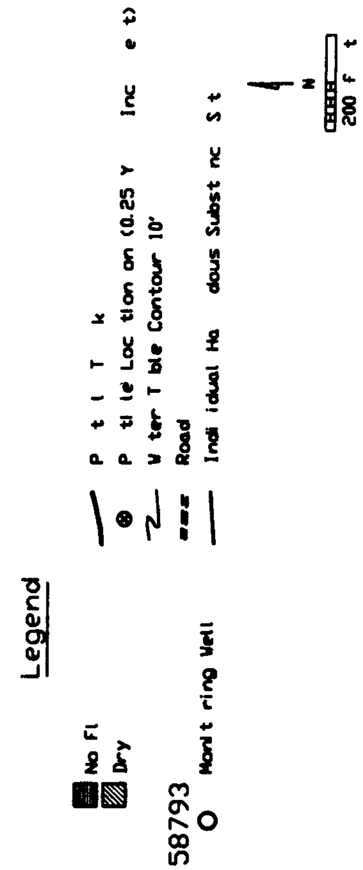
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-15D




Drawn NAM 8/9/95
Checked [illegible] 8/9/95
Approved
FILE OU5 516A.DWG

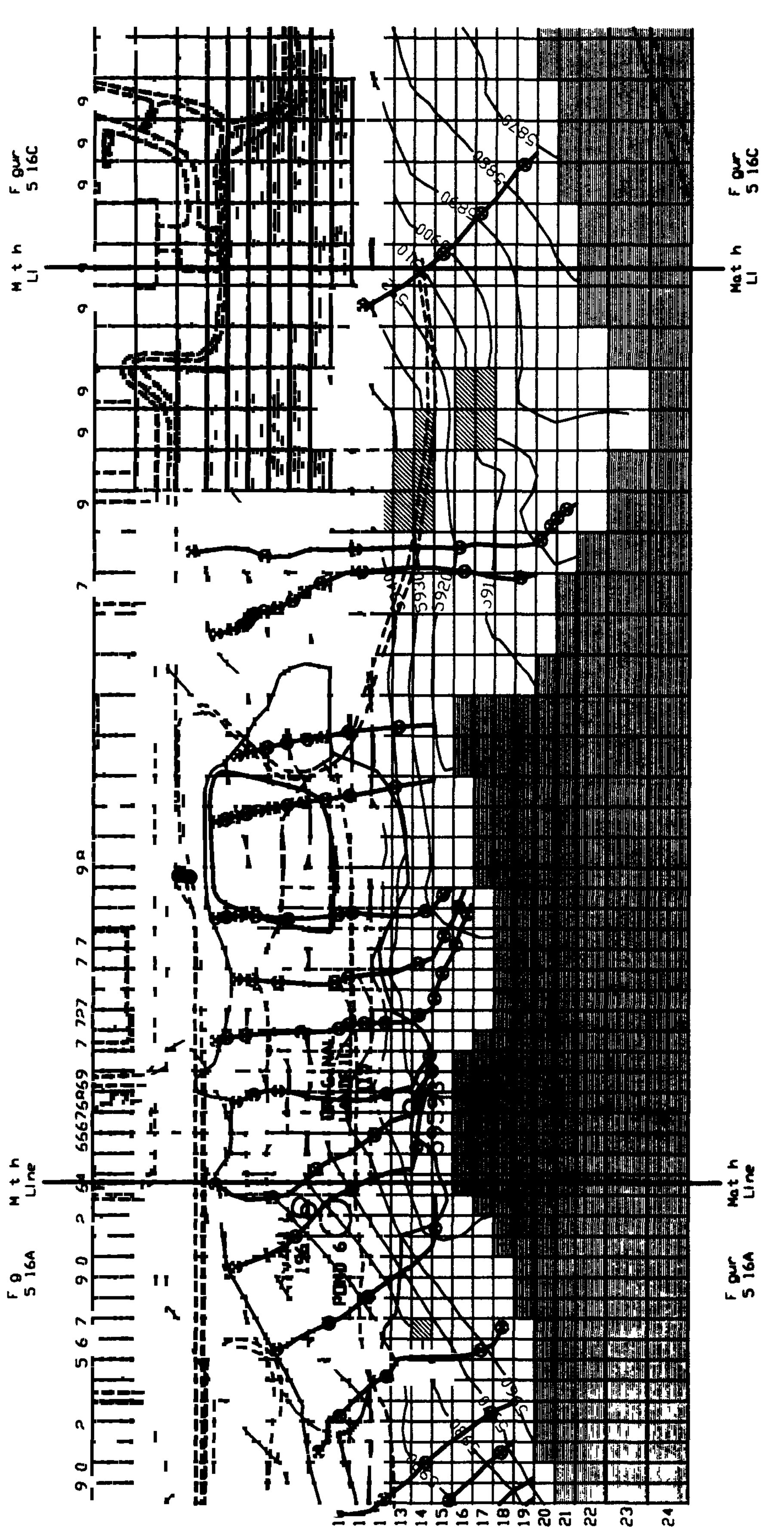
**OU5 GROUNDWATER FLOW MODEL GRID PARTICLE TRACKING**

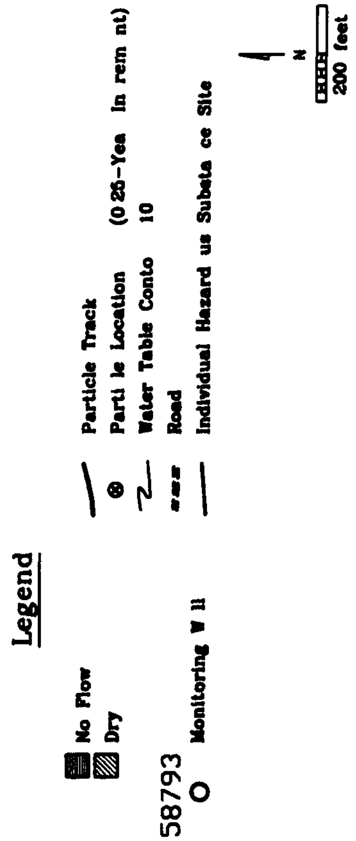
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-16A




Drawn NAM 8/9/95 Date

Checked Date

Approved Date

FILE OU5 516B.DWG

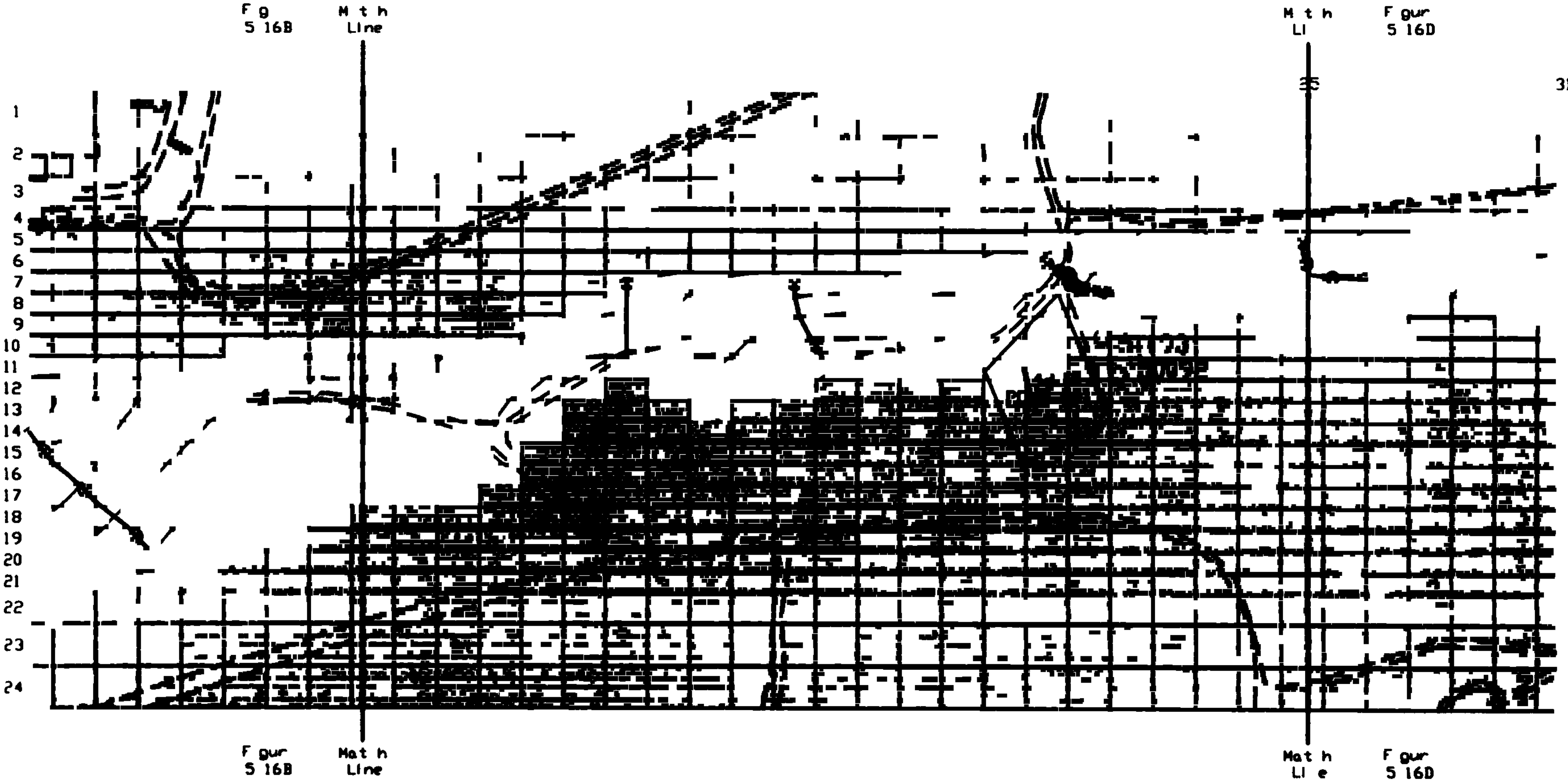
**OU5 GROUNDWATER FLOW MODEL GRID PARTICLE TRACKING**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-16B




## Legend

N Flow
Dry
58793
Mo itoring W ll
P rti le Track
Particle Locatio (0.25-Year In rement)
W ter T ble Contou 10
Road
Individual Hazard us Substance Site
N
200 feet

Drawn NAm 8/9/95 Da
Checked [illegible] 8-9-95 Dat
Approved D
FILE OU5 516C DWG

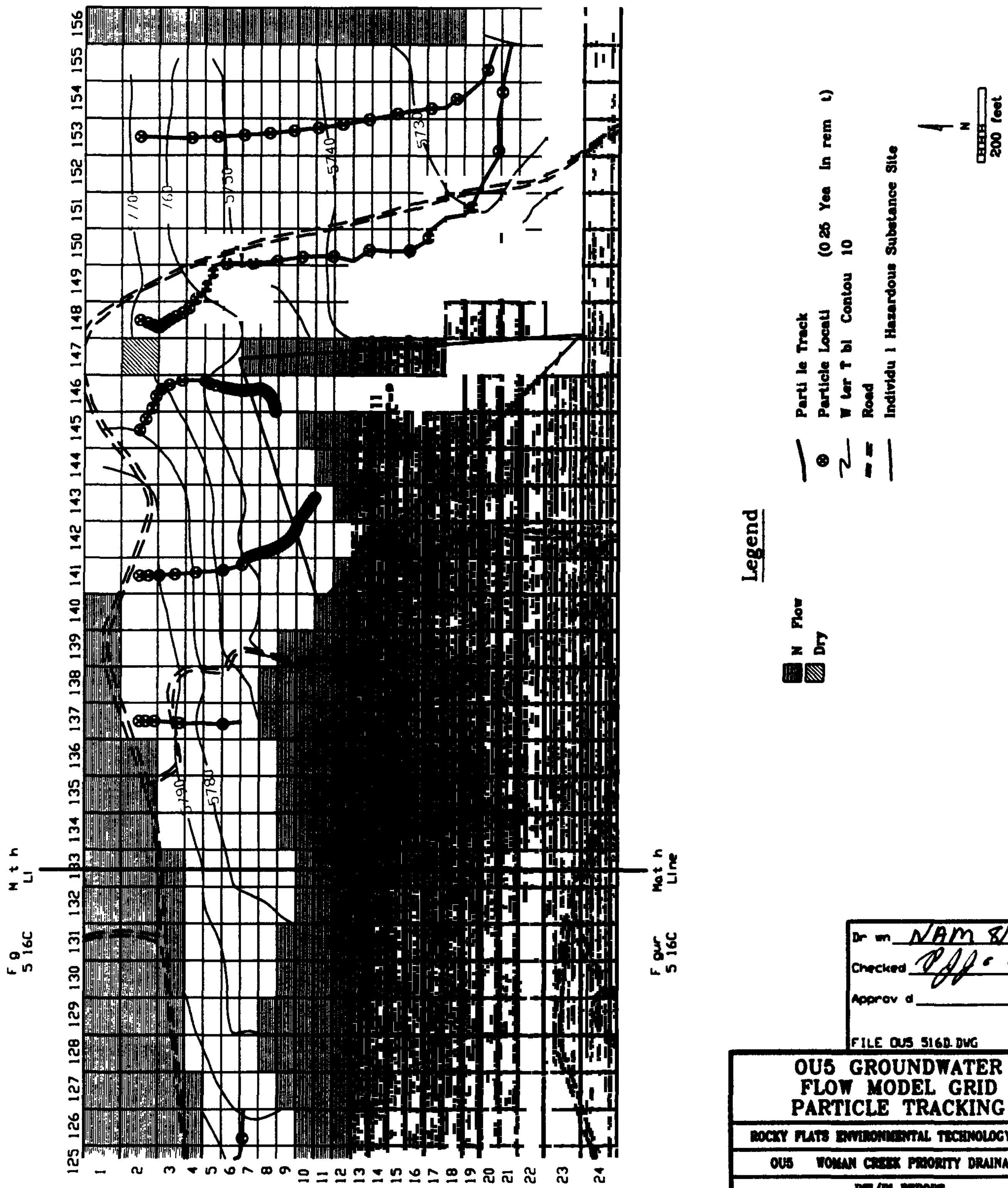
**OU5 GROUNDWATER FLOW MODEL GRID PARTICLE TRACKING**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-16C




Dr wn NAM 8/9/95

Checked
Da e

Approv d
Da

FILE OU5 516D.DWG

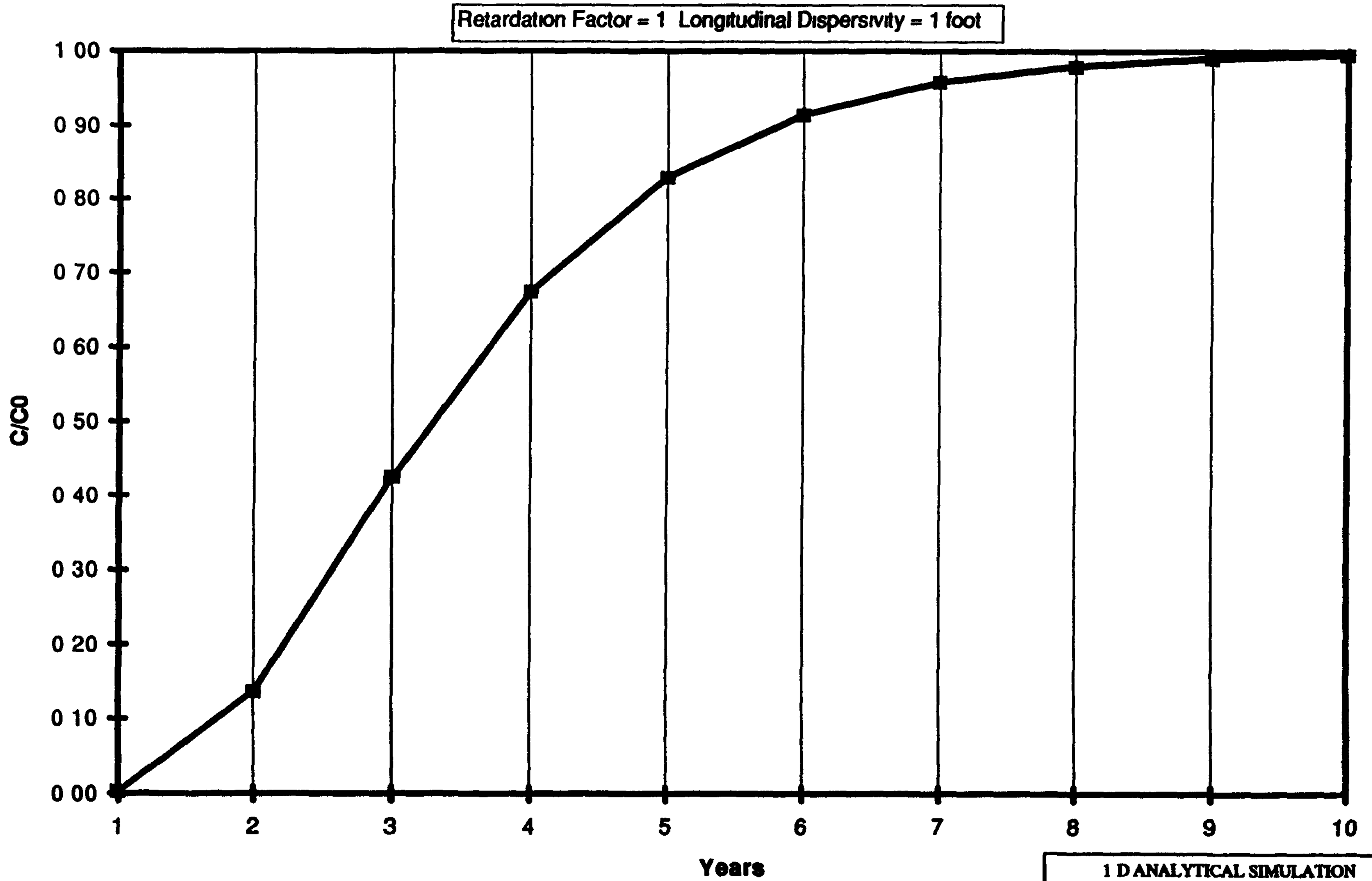
**OU5 GROUNDWATER FLOW MODEL GRID PARTICLE TRACKING**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

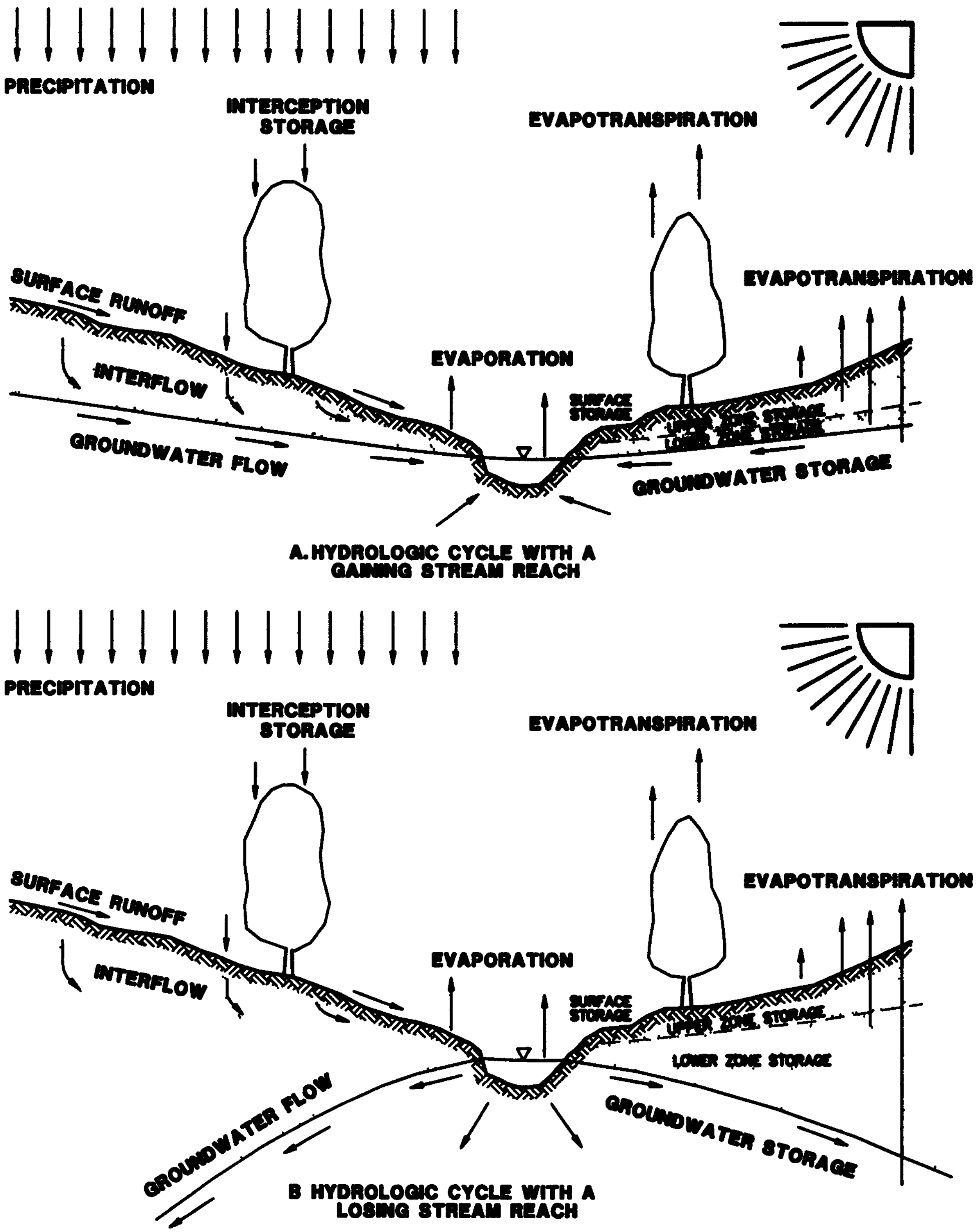
OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5 16D

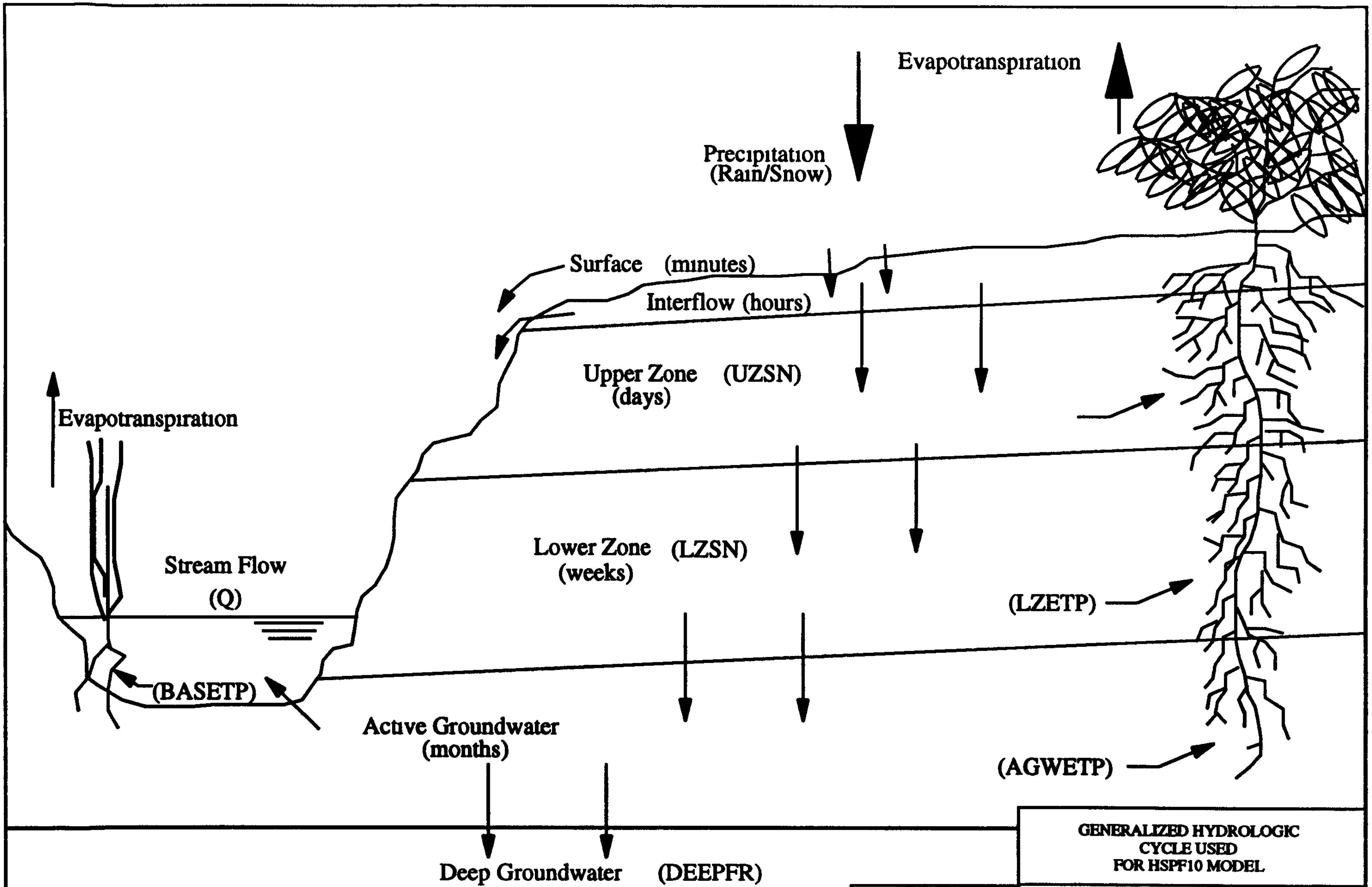



| | |
|---|---|
| DRAWN 10y 7/22/95 DATE | 1 D ANALYTICAL SIMULATION OF CONTAMINANT TRANSPORT THROUGH THE VADOSE ZONE NORTH ASH PIT IHSS 133 2 |
| CHECKED 7y 7/27/95 DATE | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| APPROVED ____ DATE | OU5 WOMAN CREEK PRIORITY DRAINAGE |
| F5-17.DRW | RFI/RI REPORT |
| | FIGURE 5-17 |




Source Modified From Bicknell and Others (1993)

| | |
|---|---|
| D aw NAM 7/31/95 Date | HYDROLOGIC CYCLE WITH GAINING AND LOSING STREAM REACHES |
| Checked 7/31/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| App oved Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5-5-19 DWG | FIGURE 5-19 |




NOTES
(hours) = General time-frame for flow to occur
(BASETP) = Model variable name.
⟶ = Generalized flow direction.

DRAWN TDY 8/8/95 DATE
CHECKED 7=7 8/8/95 DATE
APPROVED ____ DATE
F5-21.DRW

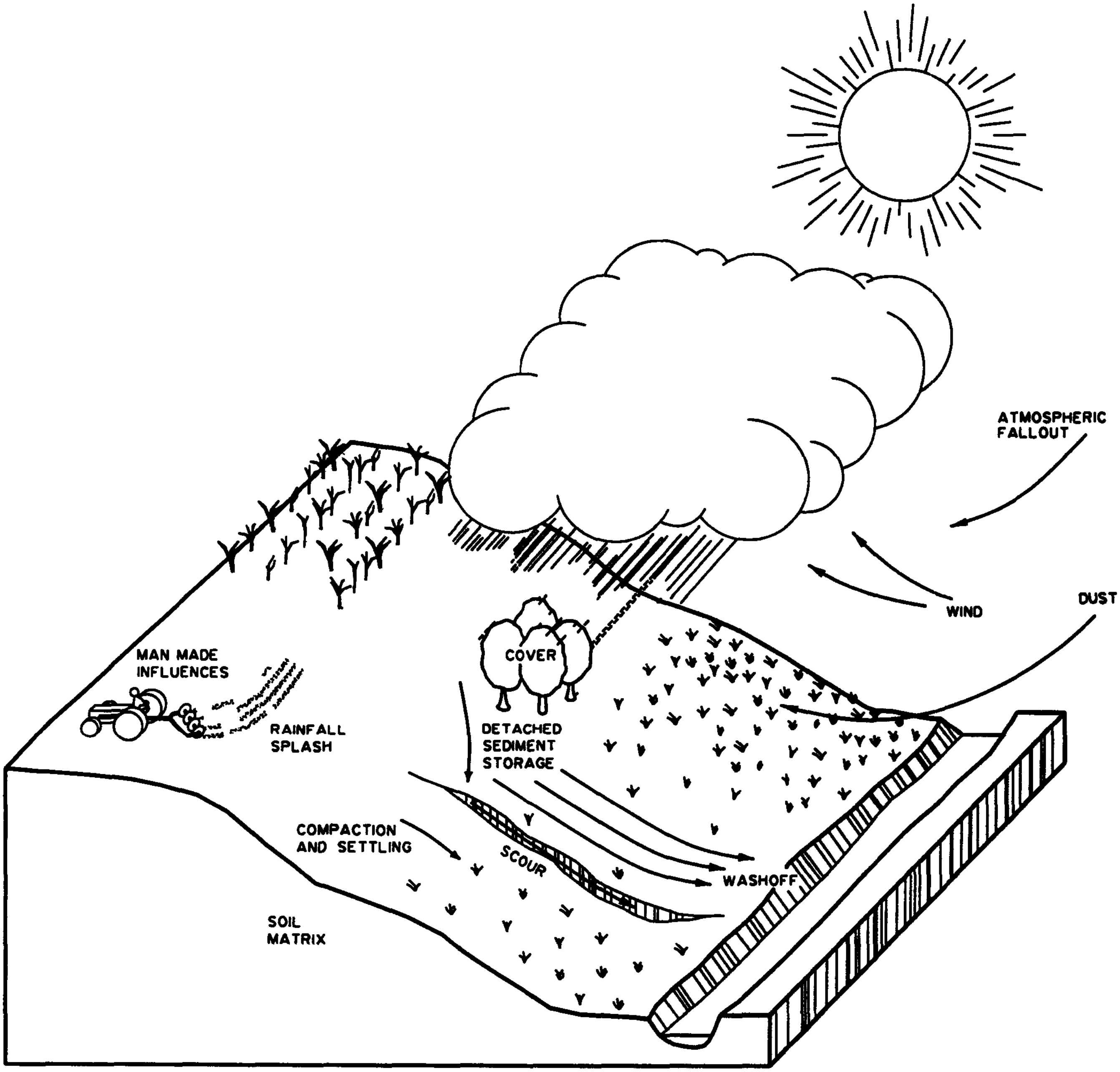
GENERALIZED HYDROLOGIC
CYCLE USED
FOR HSPF10 MODEL

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-21




Source Bicknell and Others (1993)

Drawn NAM 8/9/95 Date

Checked [illegible] 8/9/95 Date

App oved Date

FILE OU5 5 21 DWG

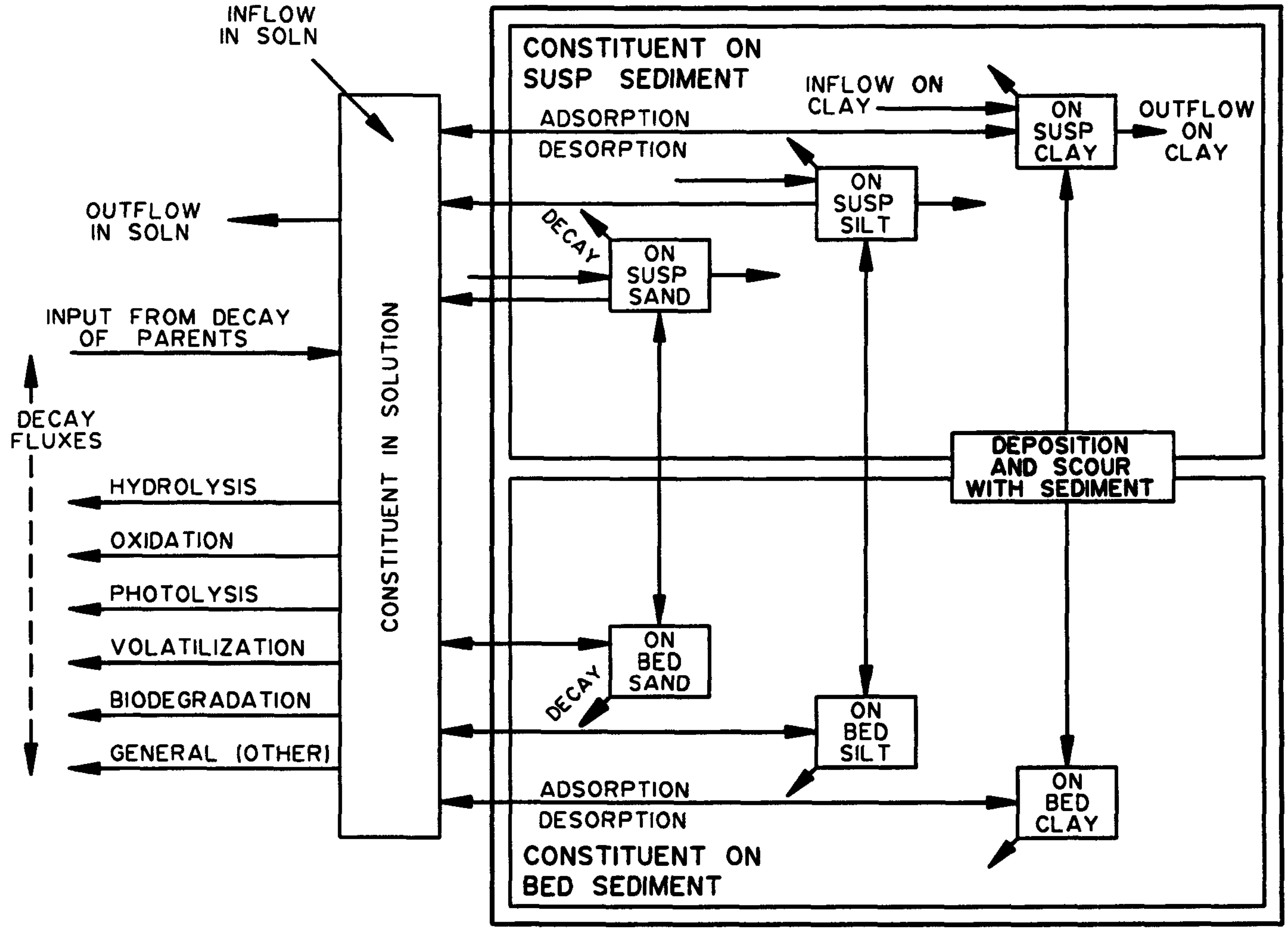
# SOIL–EROSION PROCESSES USED IN HSPF10

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

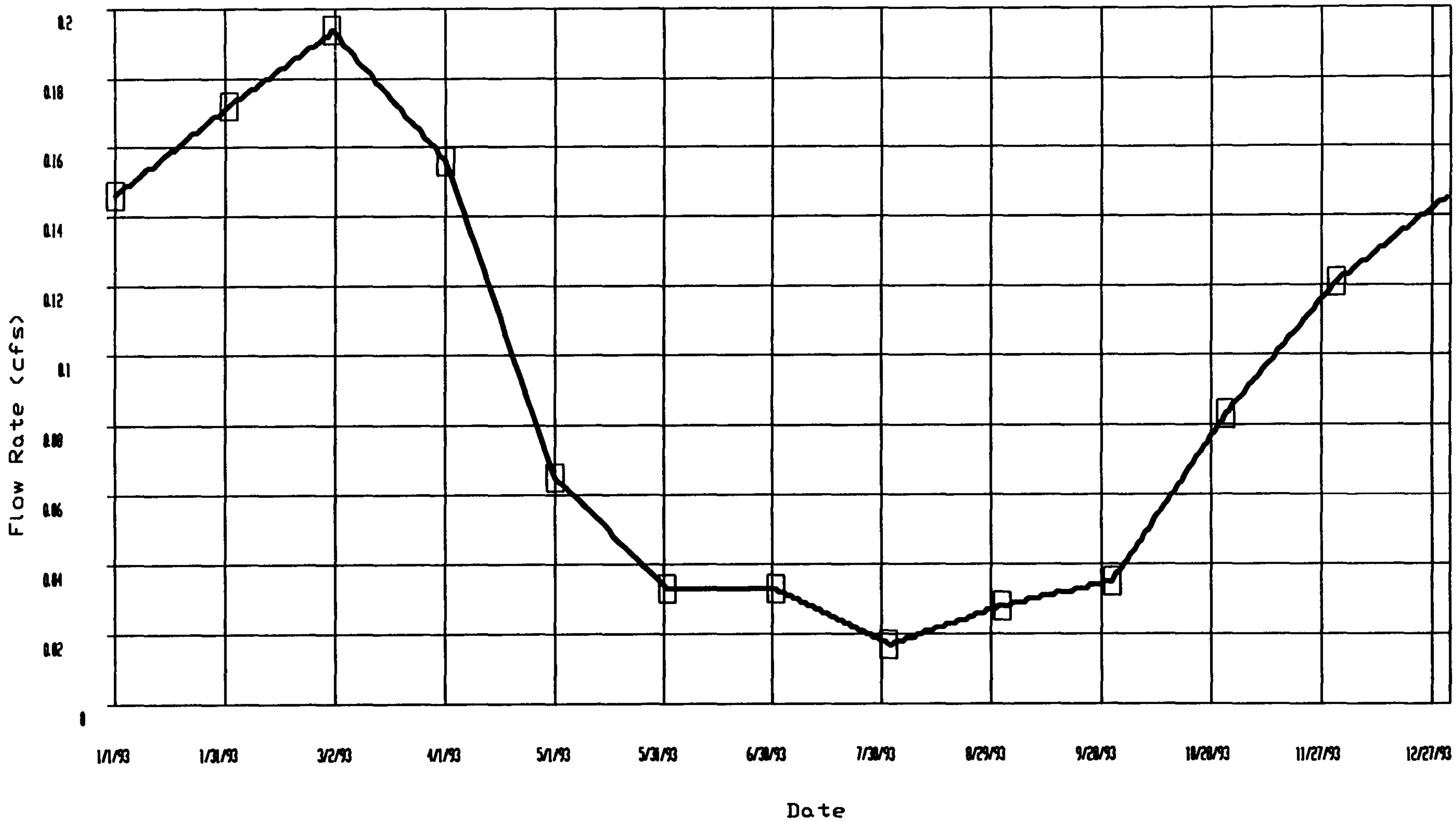
RFI/RI REPORT

FIGURE 5-22

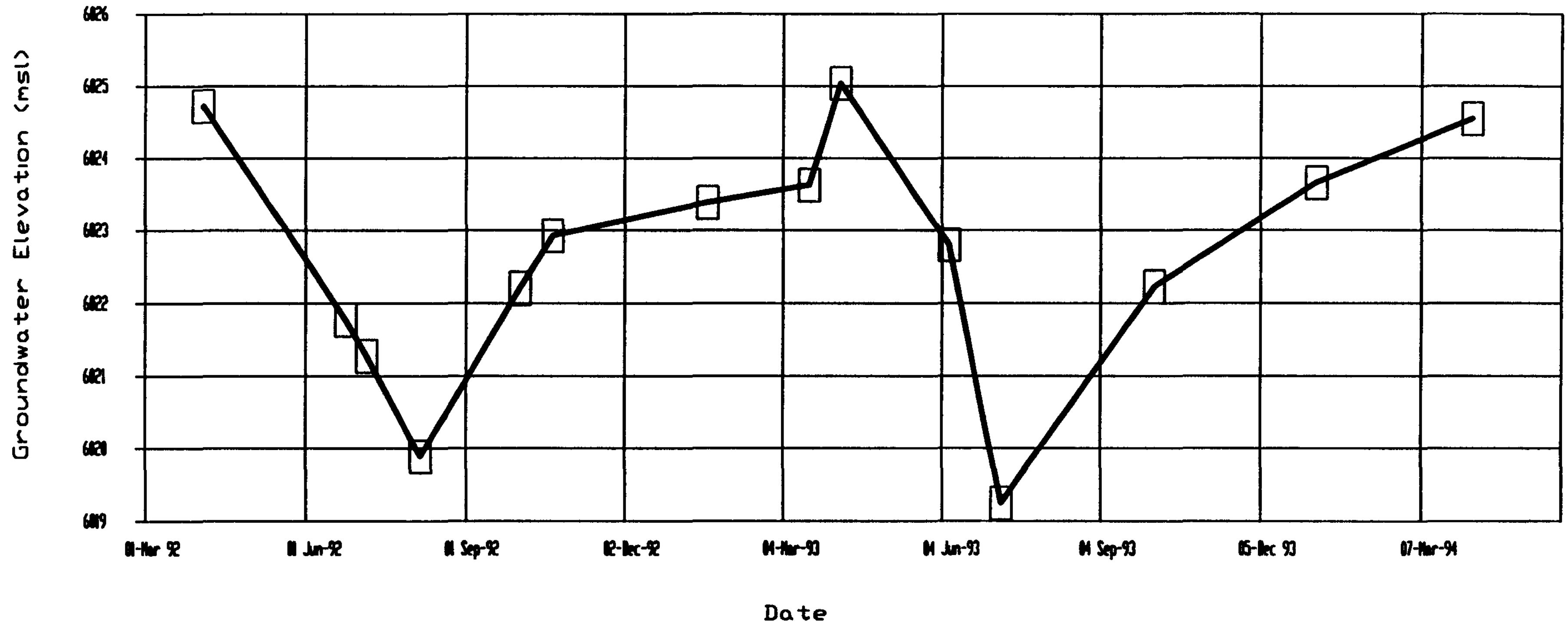



Source Bicknell and Others (1993)

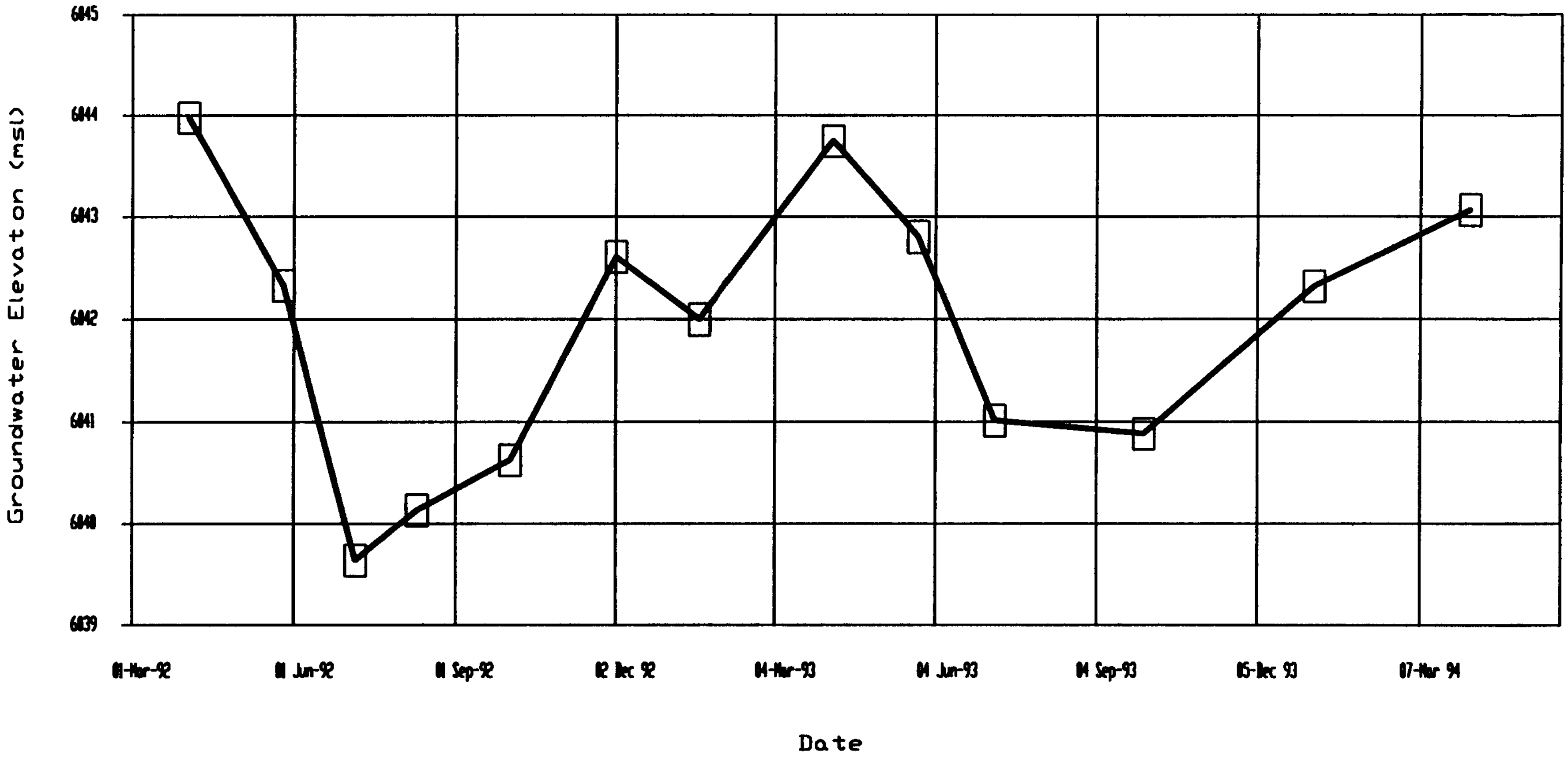
| | |
|---|---|
| Draw NAM 7/31/95 Date | **POLLUTANT-FATE MECHANISMS MODELED IN HSPF10** |
| Checked 7/31/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| App oved Date | OU5 – WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5 5 23 DWG | FIGURE 5-23 |




| | |
|---|---|
| Drawn NAM 7/31/95 Date | ANTELOPE SPRING CREEK GROUNDWATER INFLOW |
| Checked TEP 7/31/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved ______ Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5 5 25 DWG | FIGURE 5-25 |




| | |
|---|---|
| Drawn NAM 8/9/95 Date | **HYDROGRAPH of WELL 1989 near Antelope Spring Creek** |
| Checked 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved ____ Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5 526a DWG | FIGURE 5-26A |




| | |
|---|---|
| Drawn NAM | Date 8/9/95 |
| Checked [illegible] | Date 8/9/95 |
| Approved | Date |
| FILE OU5 526B.DWG | |

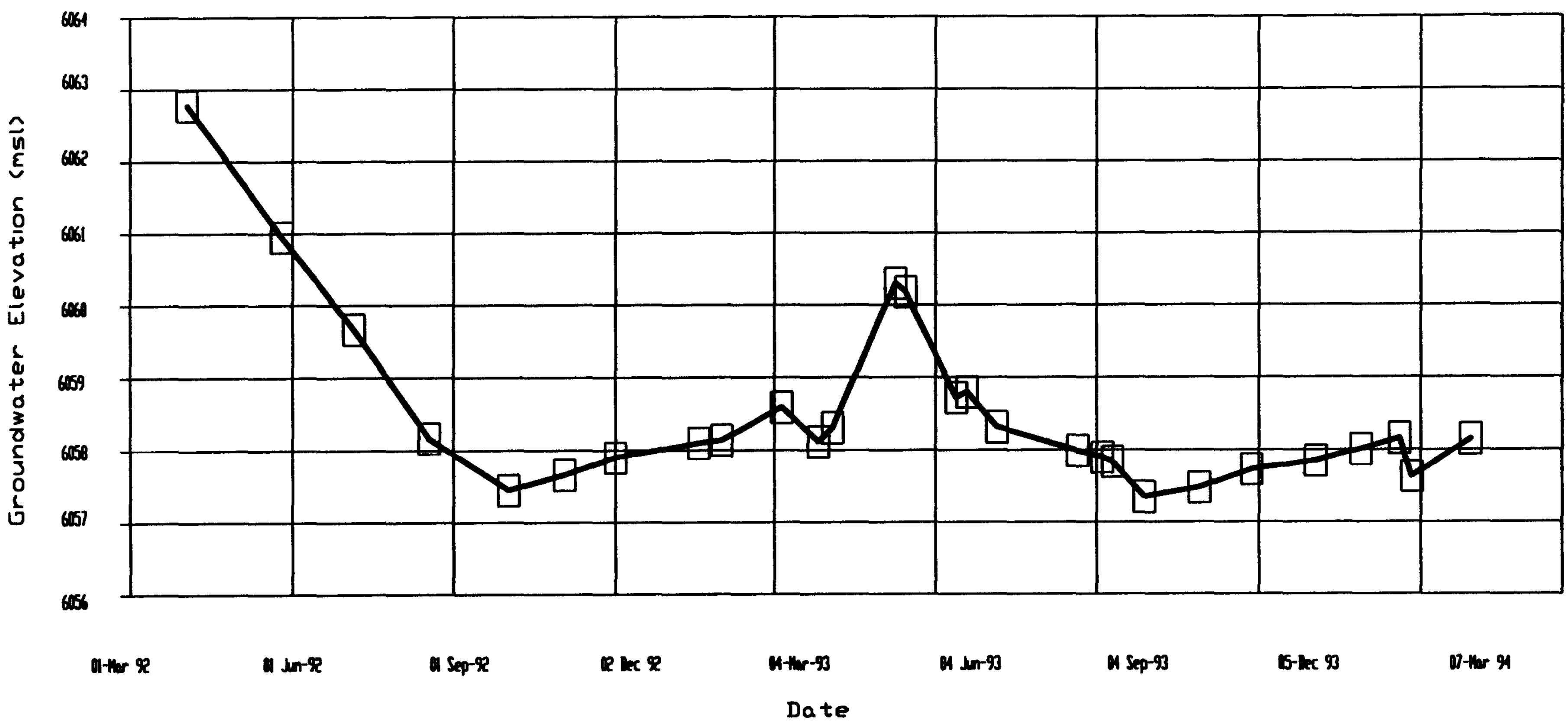
**HYDROGRAPH of WELL 2689 NEAR WOMAN CREEK**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

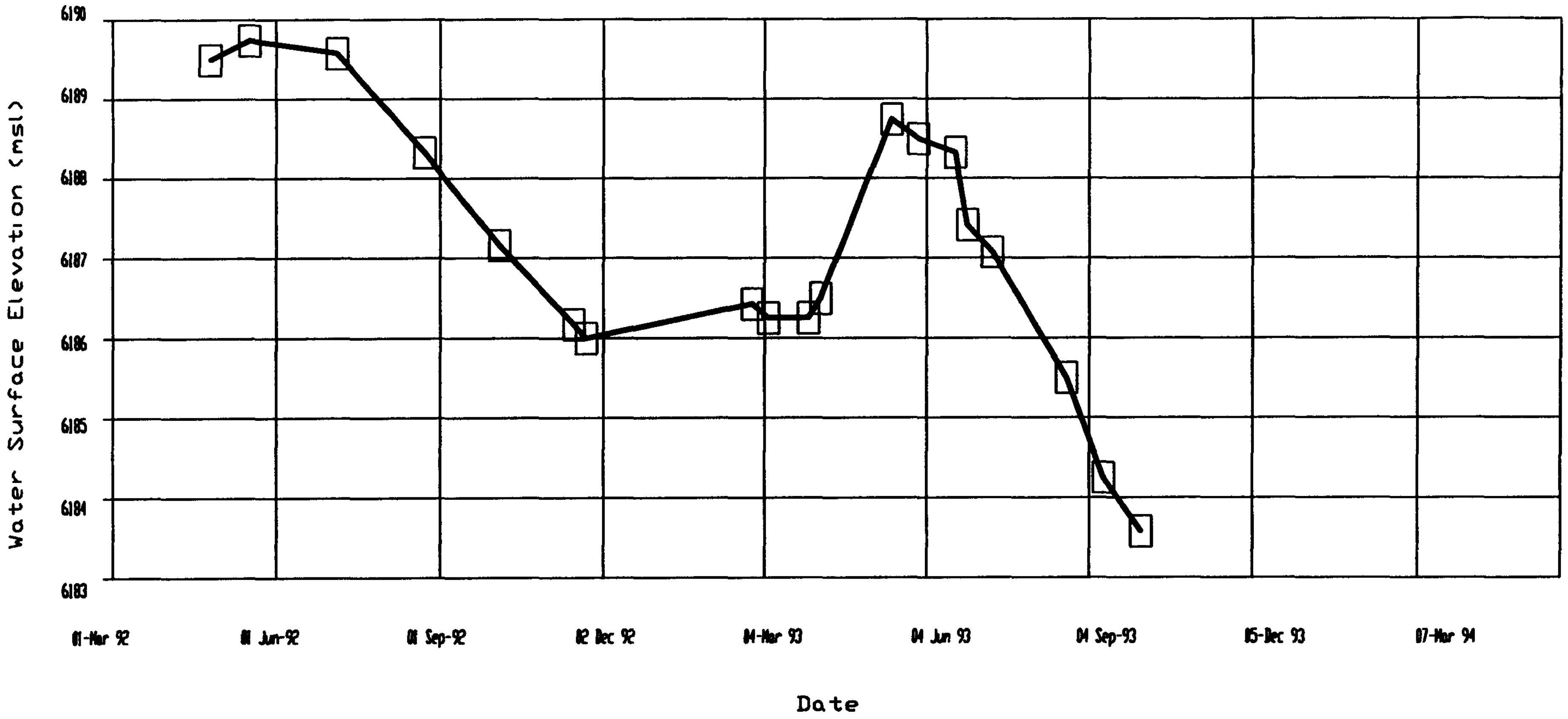
OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

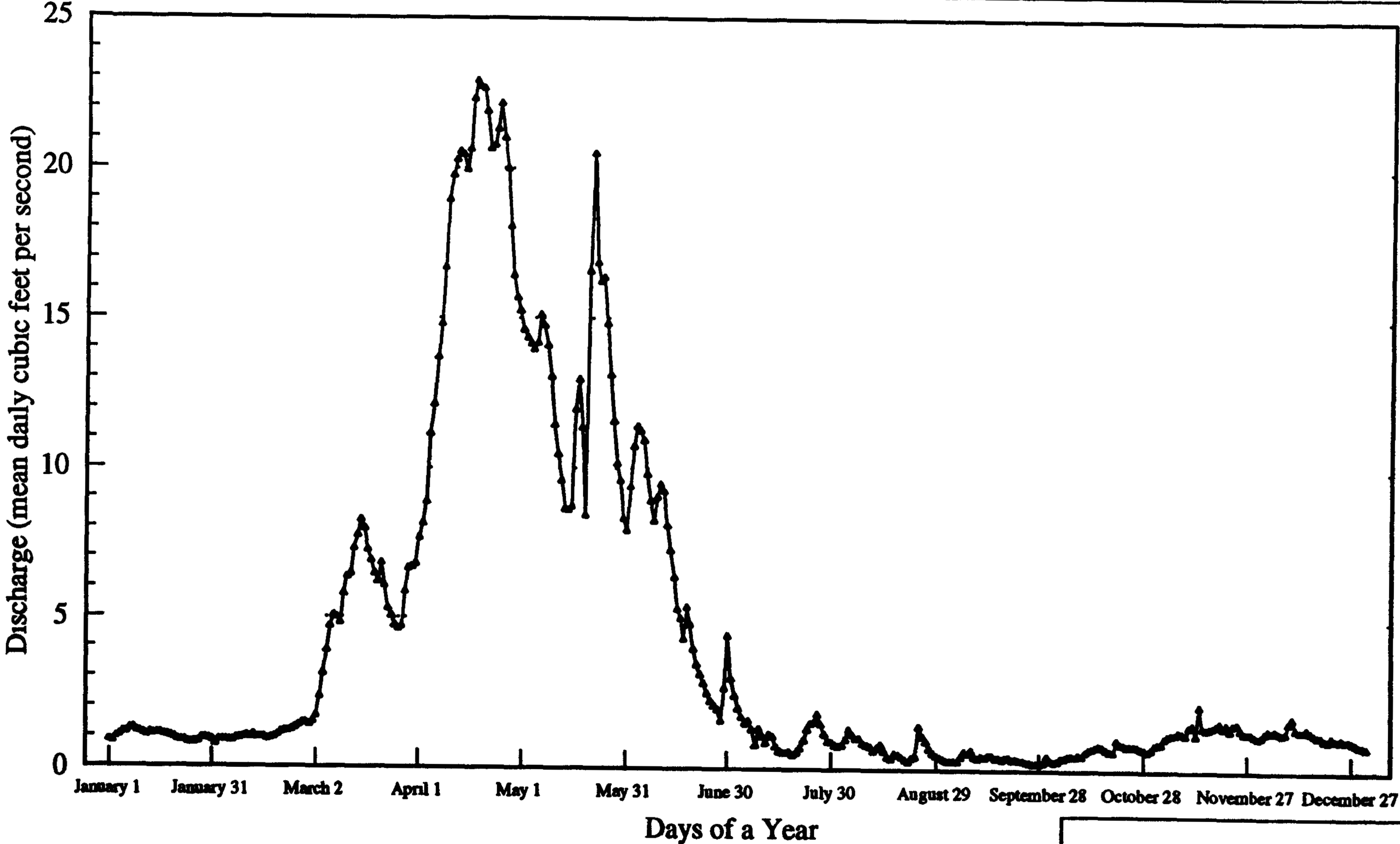
FIGURE 5-26B



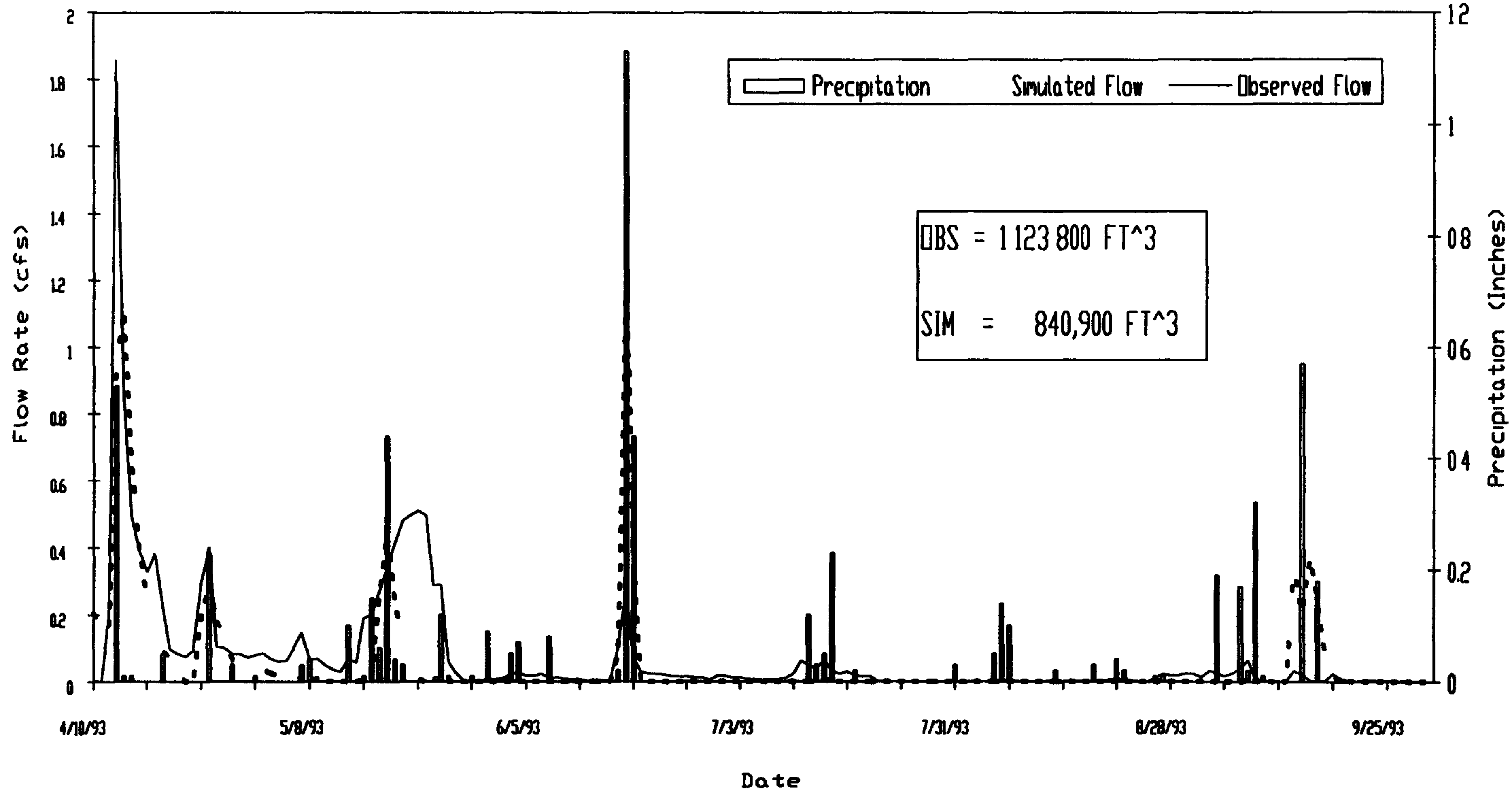

| | |
|---|---|
| Drawn NAM 8/9/95 Date | **HYDROGRAPH of WELL 5386 NEAR SOUTH WOMAN CREEK** |
| Checked 8/9/95 Date | **ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE** |
| App oved Date | **OU5 - WOMAN CREEK PRIORITY DRAINAGE** |
| | **RFI/RI REPORT** |
| FILE OU5 526C DWG | **FIGURE 5-26C** |




| | |
|---|---|
| Drawn NHM 7/31/95 Date | **HYDROGRAPH of ROCKY FLATS LAKE WATER SURFACE** |
| Checked 7/31/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5 527 DWG | FIGURE 5-27 |




| | |
|---|---|
| | MEAN DAILY DISCHARGE IN COAL CREEK AT PLAINVIEW |
| DRAWN 7/24/95 DATE | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| CHECKED 7/27/95 DATE | OU5 WOMAN CREEK PRIORITY DRAINAGE |
| APPROVED ___ DATE | RFI/RI REPORT |
| F5-28.DRW | FIGURE 5-28 |




Drawn NAM 8/9/95 Date

Checked [illegible] 8/9/95 Date

Approved ______ Date

FILE OU5 529a DWG

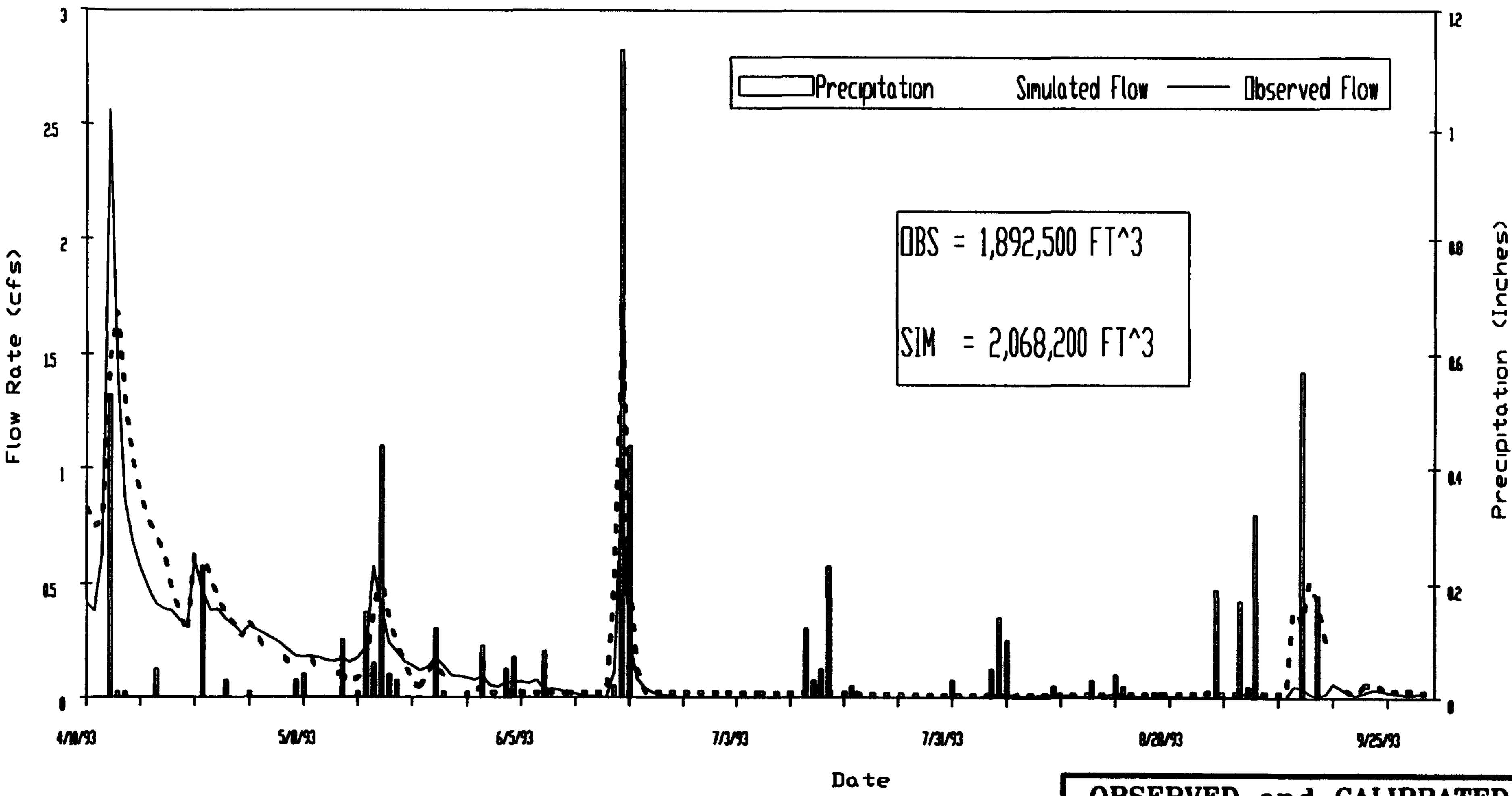
# OBSERVED and CALIBRATED HYDROGRAPHS OUTFLOW of BASIN 2

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

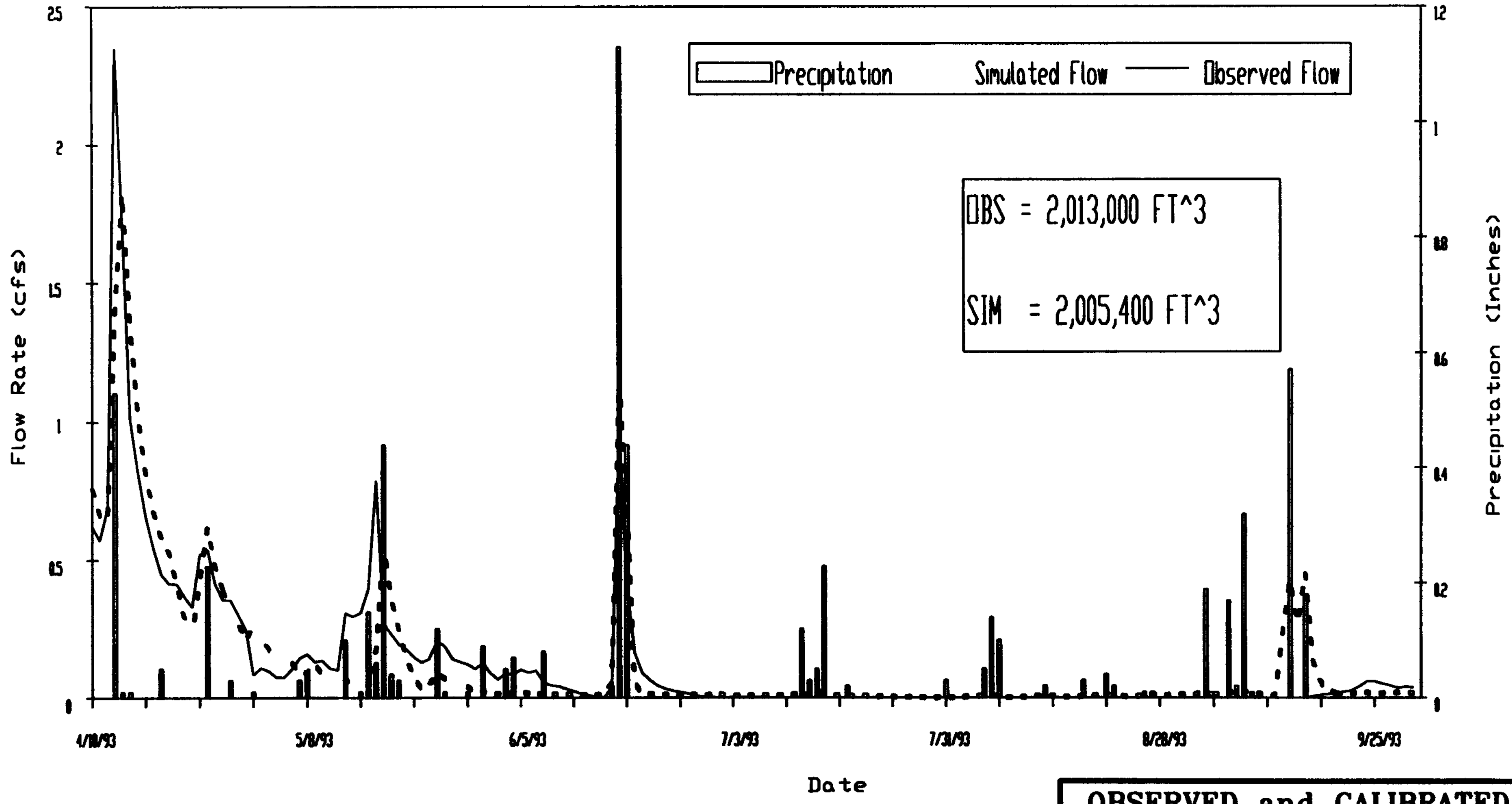
OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-29A




| | |
|---|---|
| Drawn NAM 8/9/95 Date | **OBSERVED and CALIBRATED HYDROGRAPHS OUTFLOW of BASIN 4** |
| Checked [illegible] 8/9/95 Date | **ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE** |
| Approved _____ Date | **OU5 - WOMAN CREEK PRIORITY DRAINAGE** |
| | **RFI/RI REPORT** |
| FILE OU5 529B DWG | **FIGURE 5-29B** |




| | |
|---|---|
| Drawn NAM 8/9/95 | Date |
| Checked 8/9/95 | Date |
| Approved | Date |
| FILE OU5 529C.DWG | |

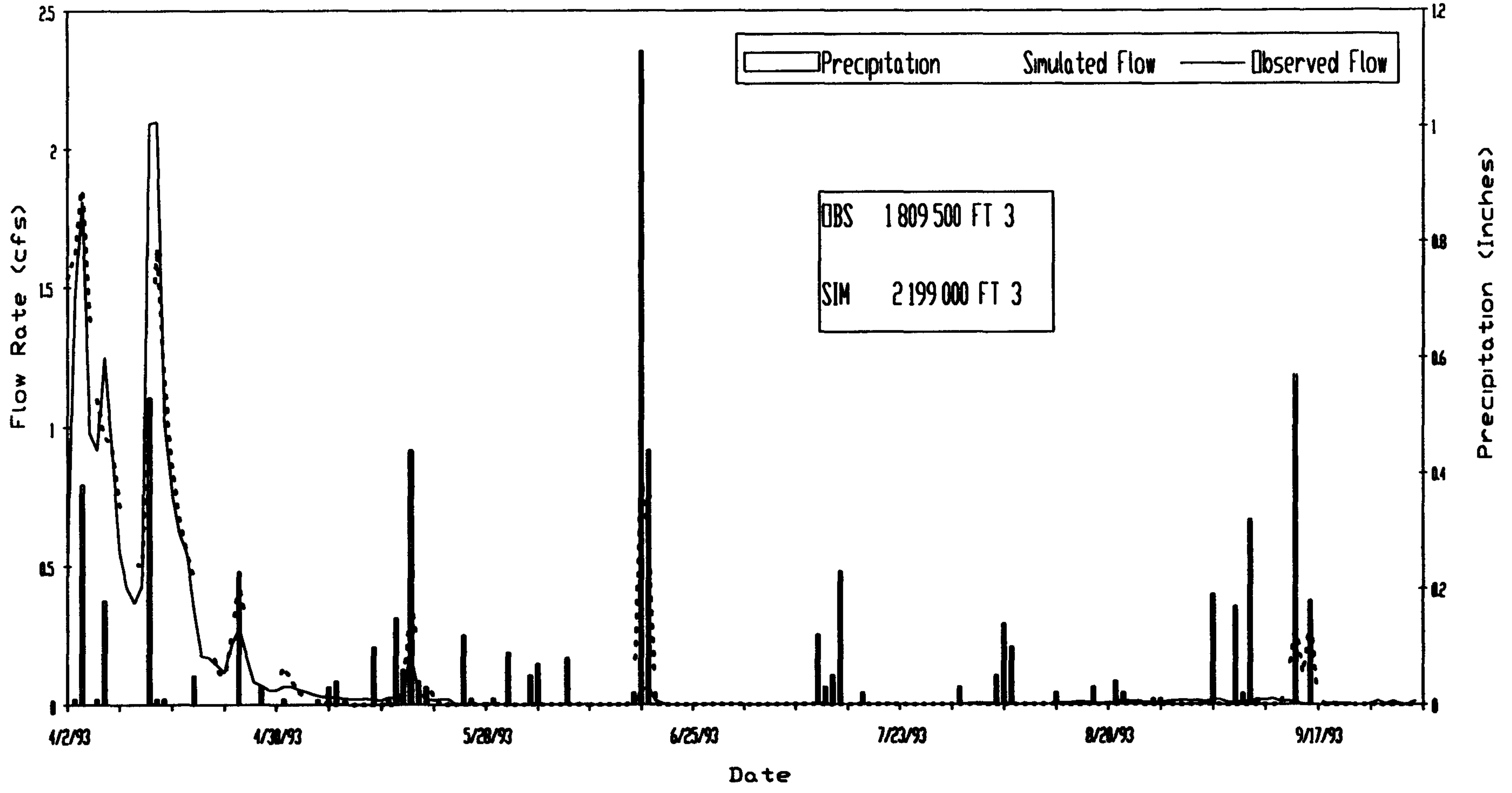
**OBSERVED and CALIBRATED HYDROGRAPHS OUTFLOW of BASIN 5**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-29C




| | |
|---|---|
| Drawn NAN 8/9/95 Date | |
| Checked TC17 8/9/95 Date | |
| Approved ____ Date | |
| FILE OU5-529D.DWG | |

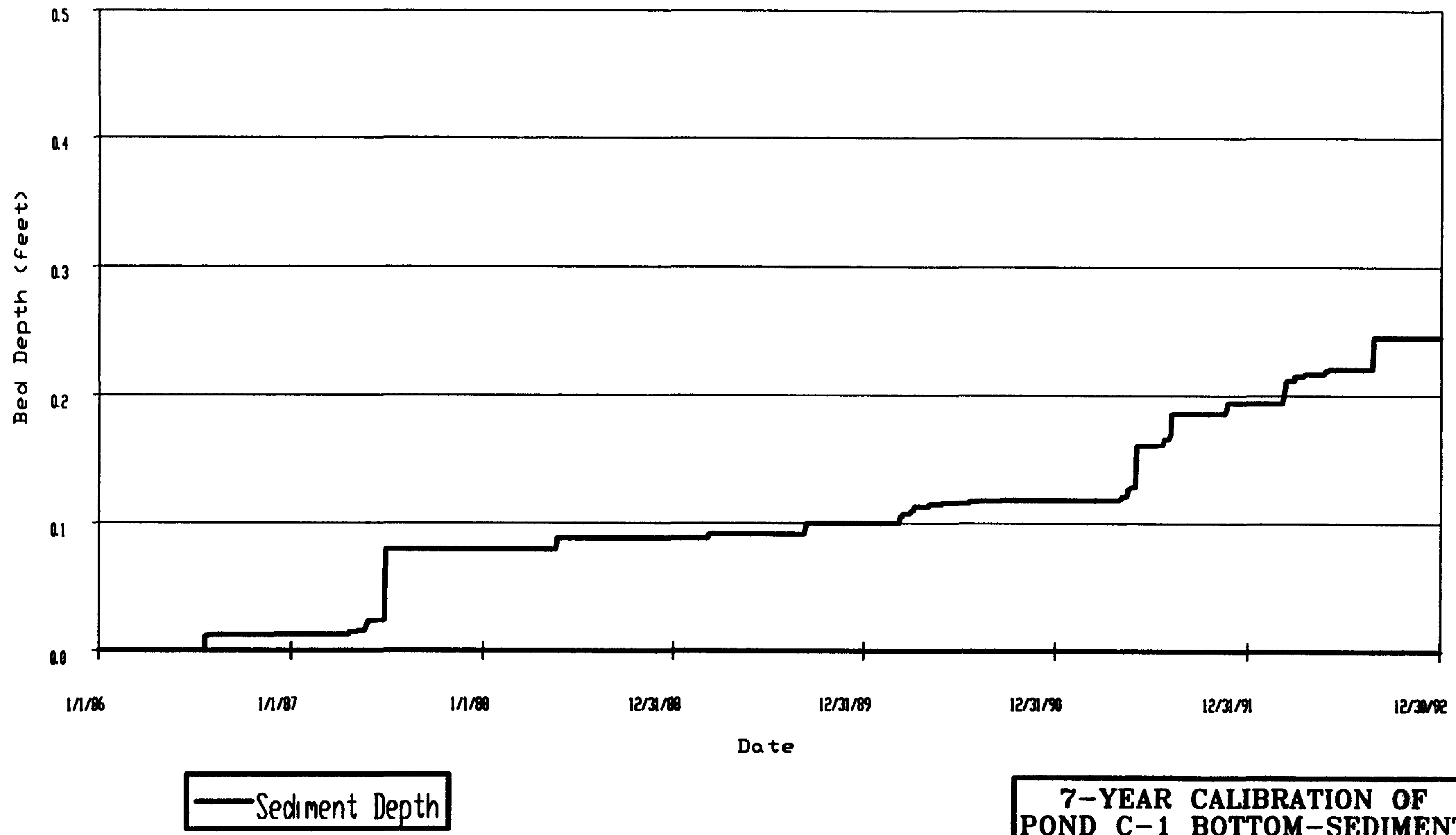
**OBSERVED and CALIBRATED HYDROGRAPHS OUTFLOW of BASIN 6**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

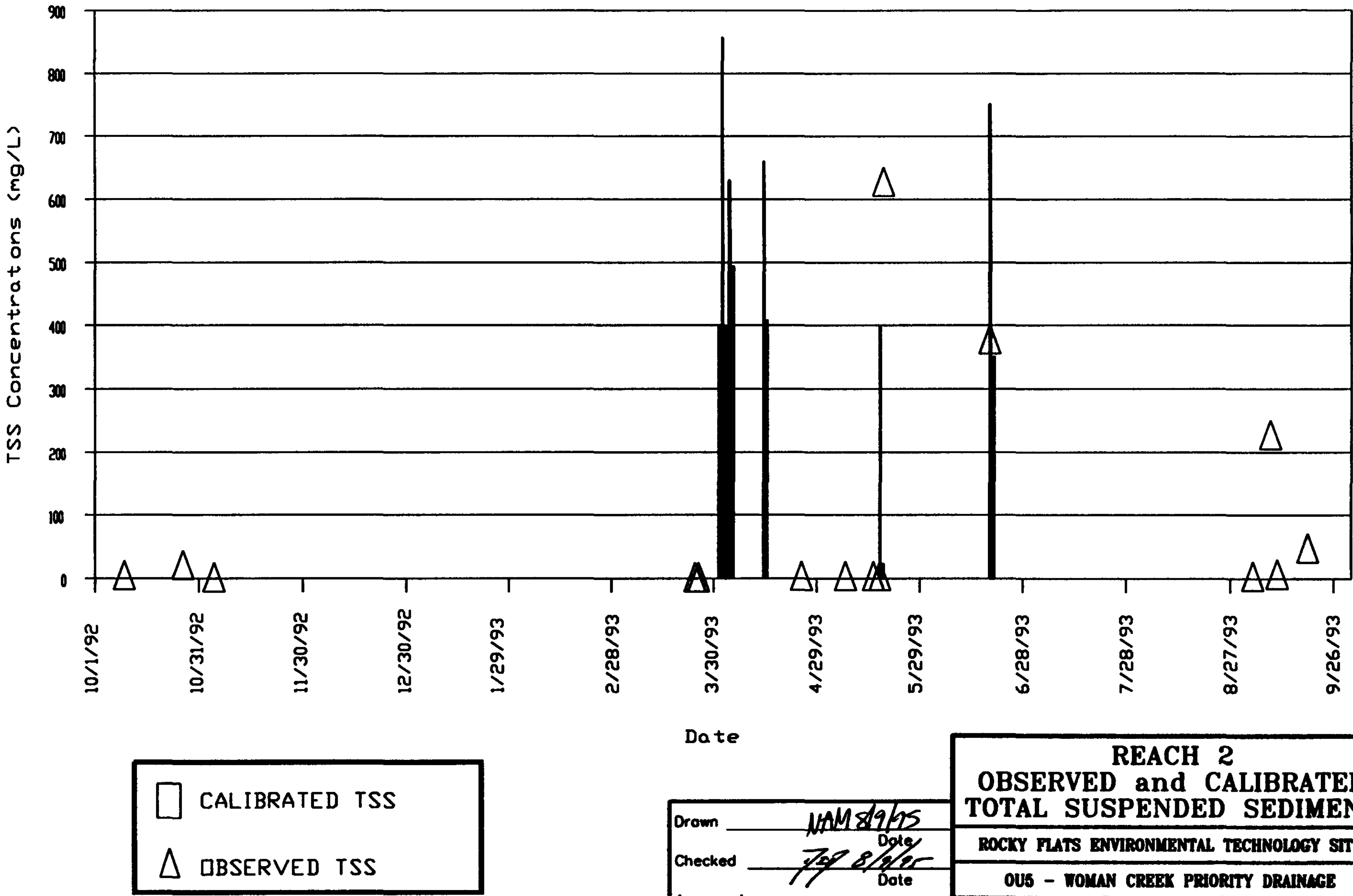
OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-29D




| | |
|---|---|
| Drawn NAM 7/31/95 Date | **7-YEAR CALIBRATION OF POND C-1 BOTTOM-SEDIMENT DEPOSITION** |
| Checked TEP 7/31/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5 5 30 DVG | FIGURE 5-30 |




| | |
|---|---|
| Drawn NAM 8/9/95 | Date |
| Checked 8/9/95 | Date |
| Approved | Date |
| FILE OU5-531A.DWG | |

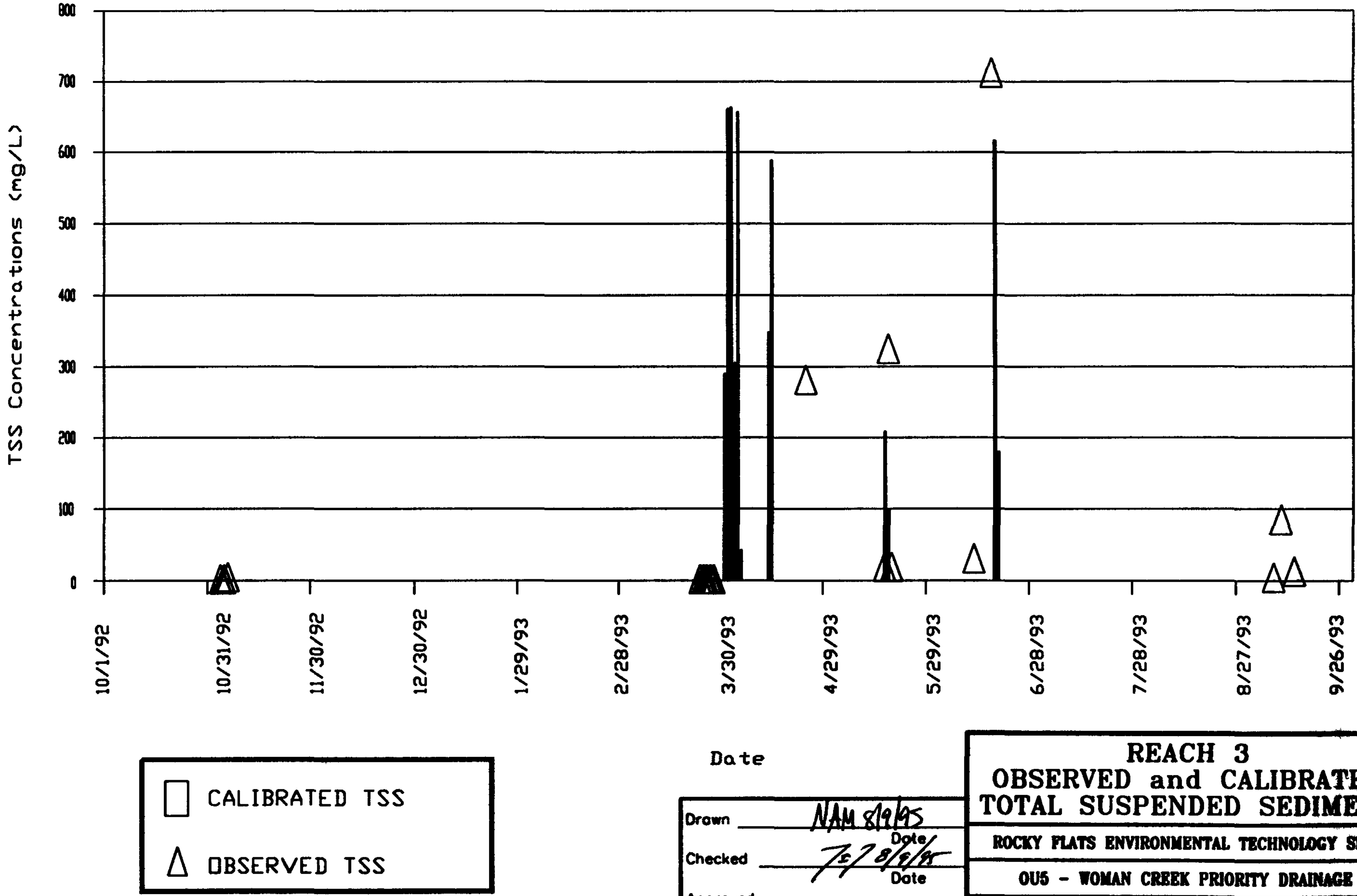
REACH 2
OBSERVED and CALIBRATED
TOTAL SUSPENDED SEDIMENT

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

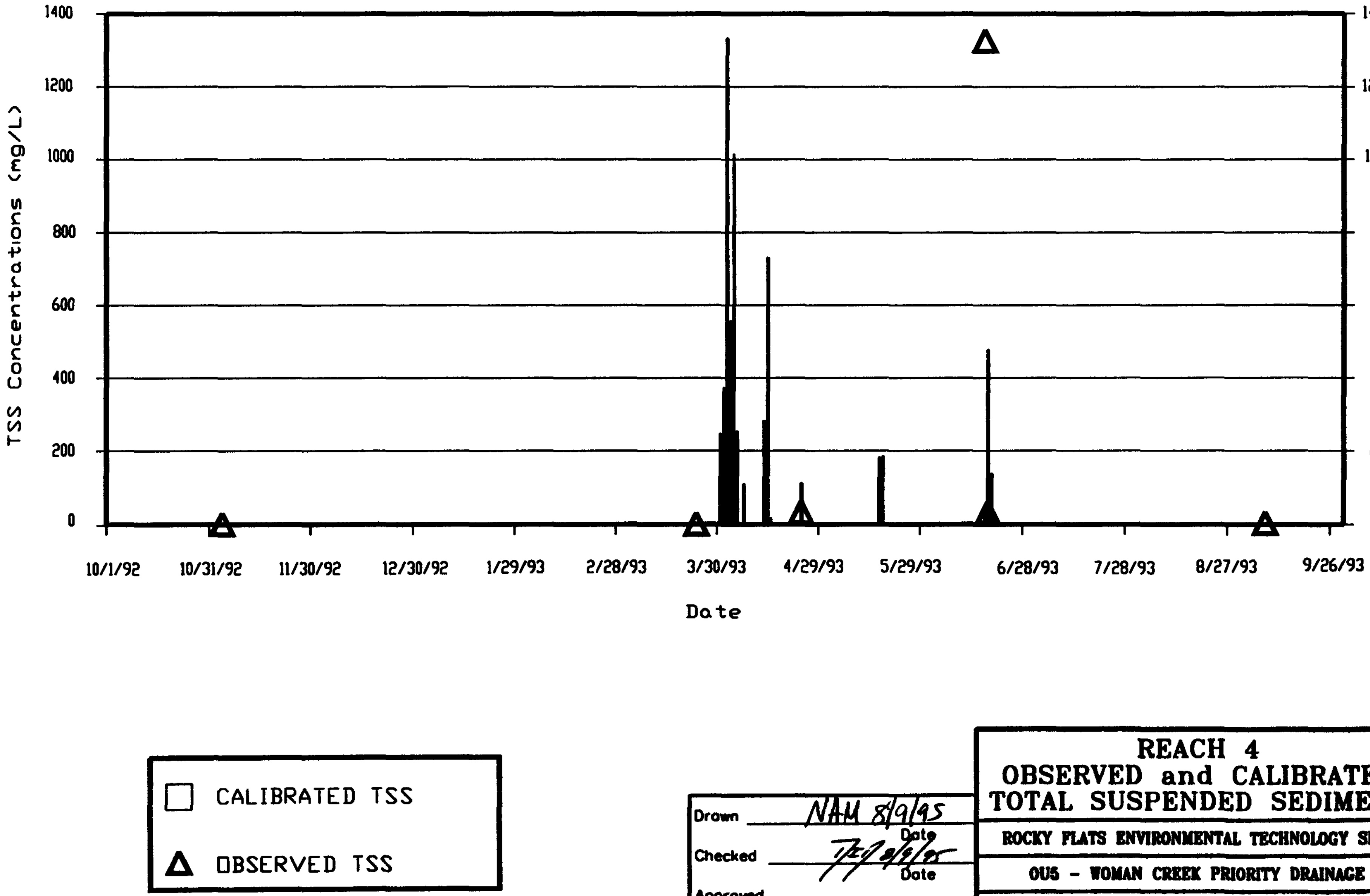
OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

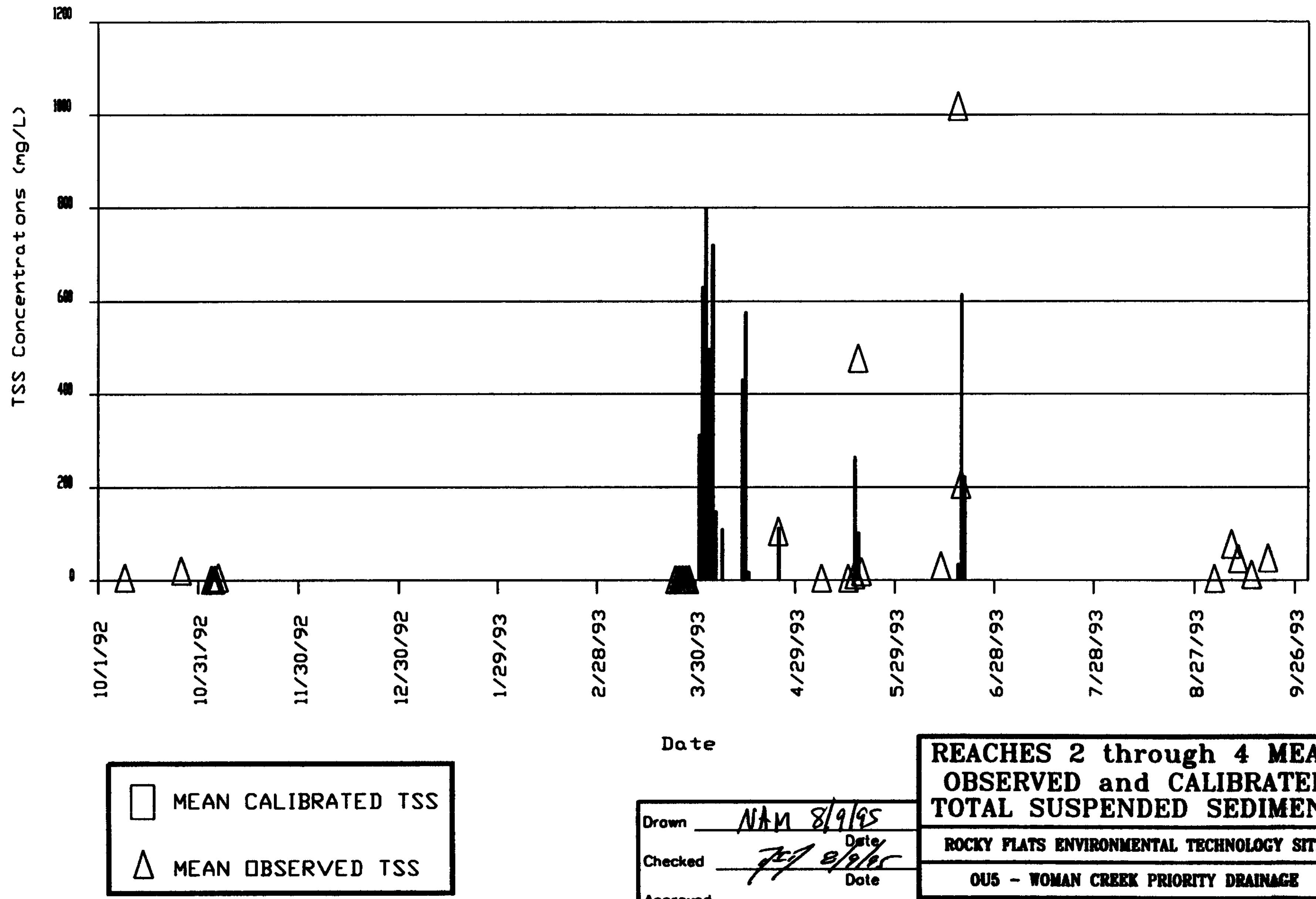
FIGURE 5-31A



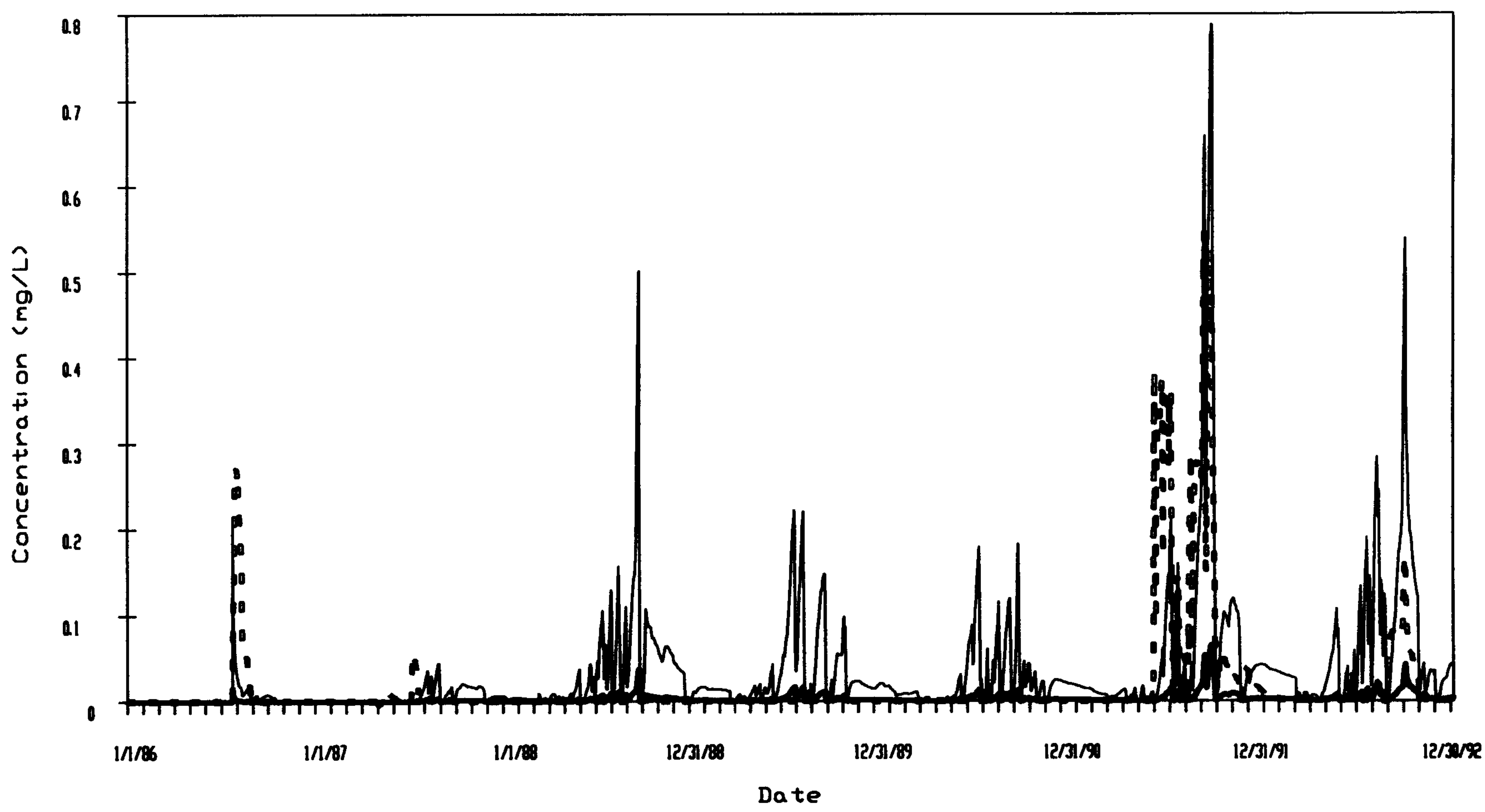

| | |
|---|---|
| Drawn NAM 8/9/95 Date | **REACH 3 OBSERVED and CALIBRATED TOTAL SUSPENDED SEDIMENT** |
| Checked 8/9/95 Date | **ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE** |
| Approved Date | **OU5 - WOMAN CREEK PRIORITY DRAINAGE** |
| | **RFI/RI REPORT** |
| FILE OU5 531B DWG | **FIGURE 5-31B** |



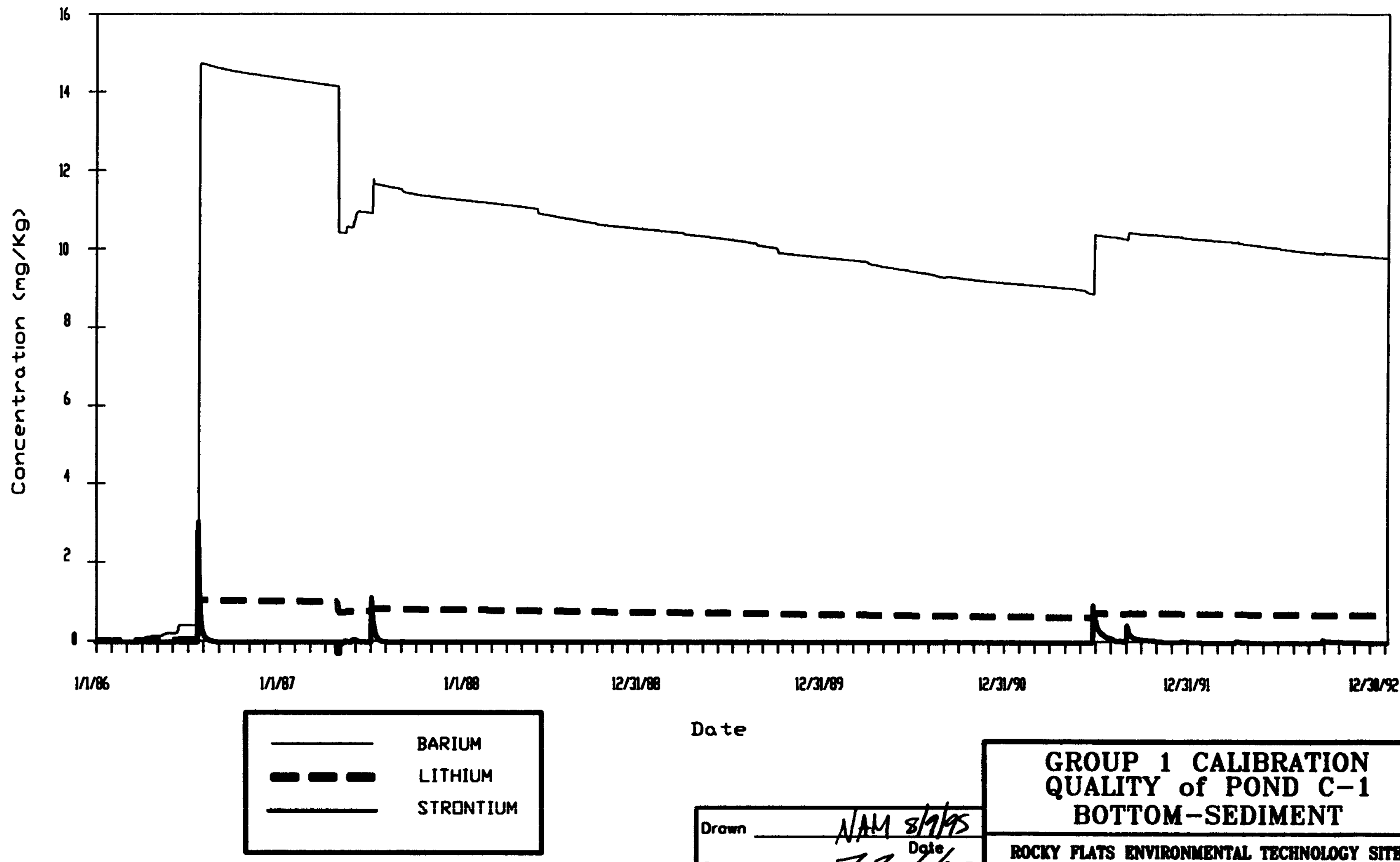

| | |
|---|---|
| Drawn NAM 8/9/95 Date | REACH 4<br>OBSERVED and CALIBRATED<br>TOTAL SUSPENDED SEDIMENT |
| Checked [illegible] 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved ______ Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5-531C DWG | FIGURE 5-31C |




| | |
|---|---|
| Drawn NAM 8/9/95 Date | **REACHES 2 through 4 MEAN OBSERVED and CALIBRATED TOTAL SUSPENDED SEDIMENT** |
| Checked [illegible] 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE F5 31D DWG | FIGURE 5-31D |




| | |
|---|---|
| Drawn NAM 7/31/95 Date | GROUP 1 CALLIBRATION QUALITY OF POND C-1 WATER COLUMN |
| Checked 7/31/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved ______ Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5532A1 DWG | FIGURE 5-32A1 |




Drawn NAM 8/9/95 Date
Checked [illegible] 8/9/95 Date
Approved ______ Date
FILE OU5532A2 DWG

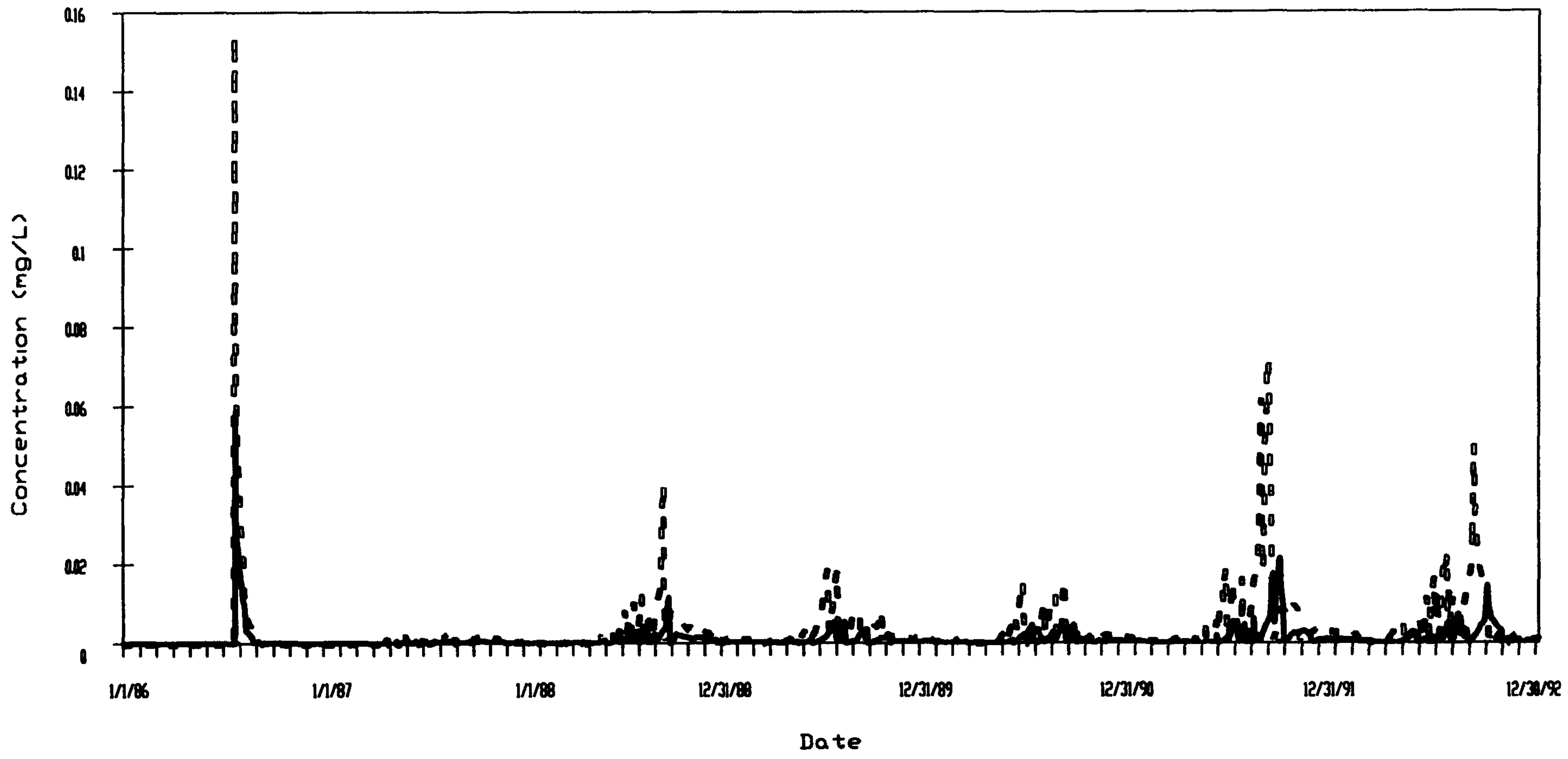
**GROUP 1 CALIBRATION QUALITY of POND C-1 BOTTOM-SEDIMENT**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

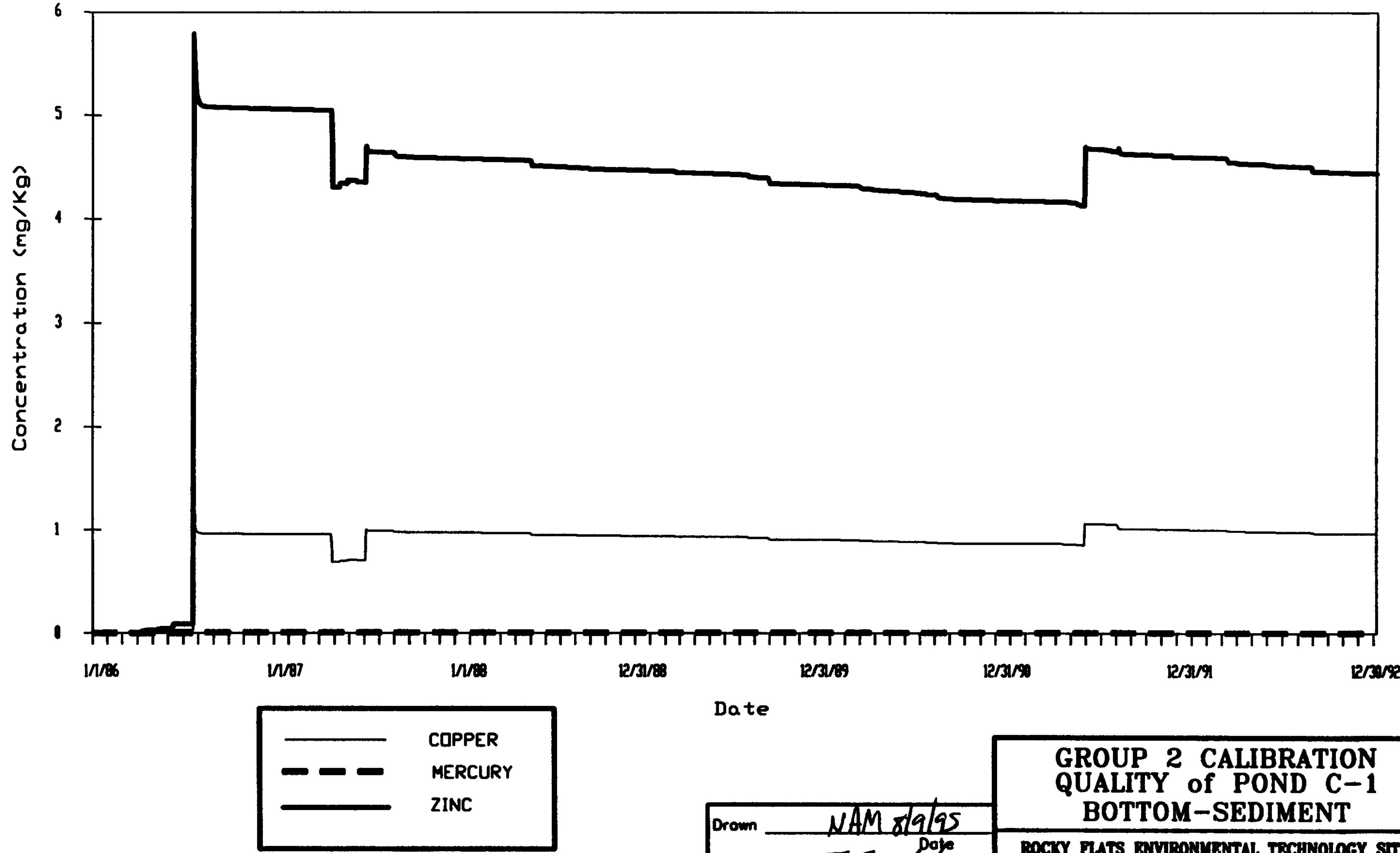
OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

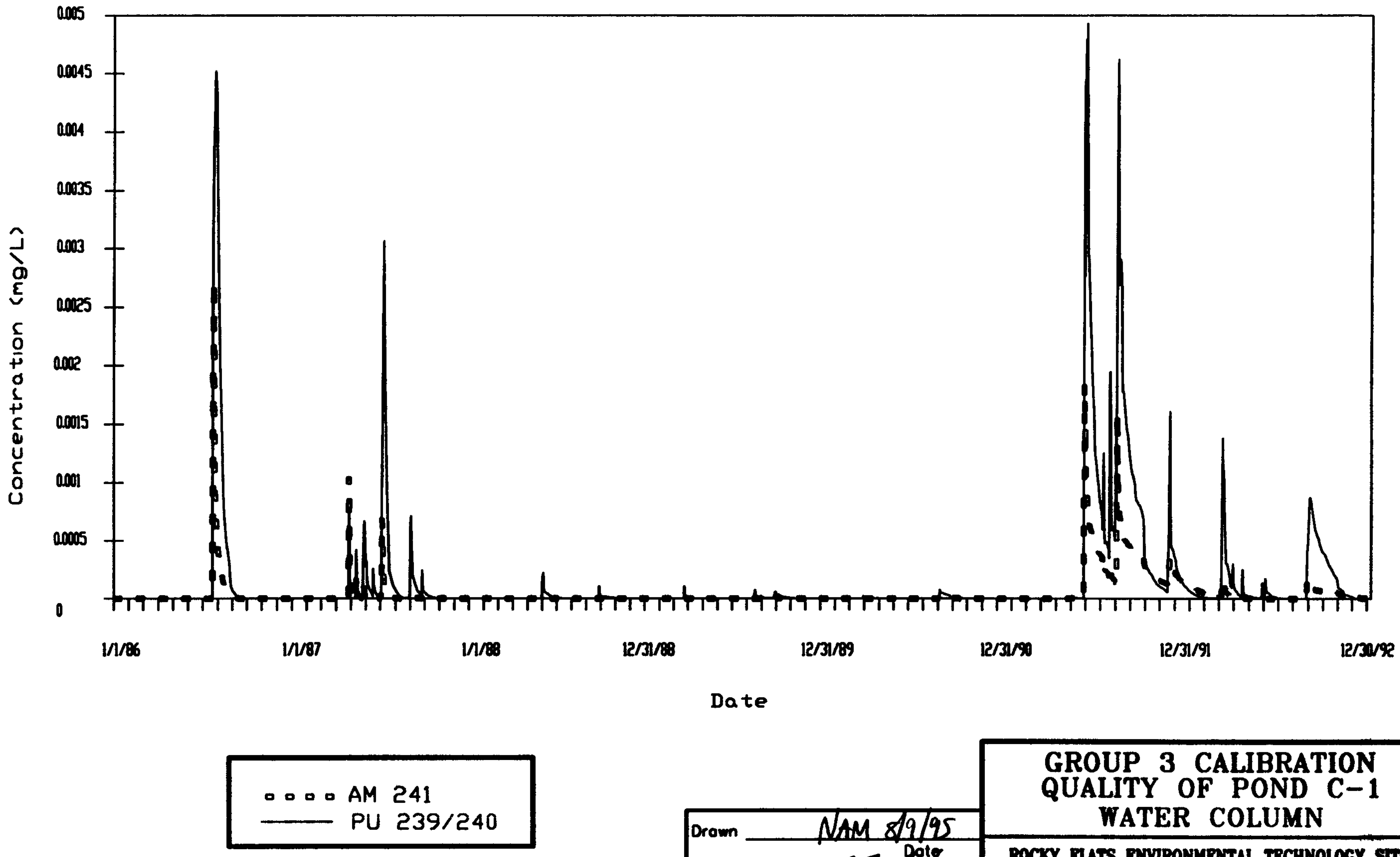
FIGURE 5-32A2



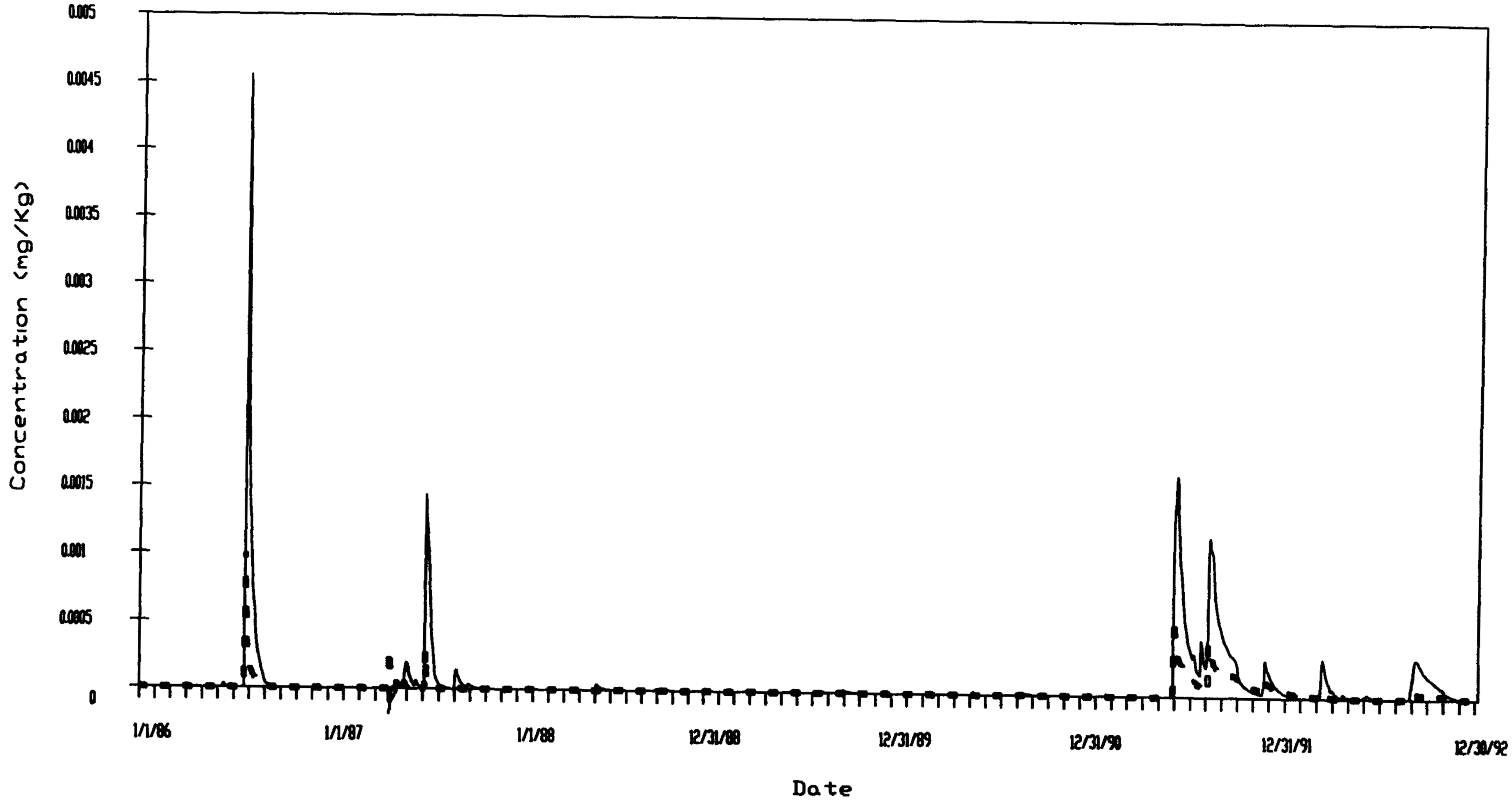

| | |
|---|---|
| Drawn AAH 8/9/95 Date | GROUP 2 CALIBRATION QUALITY OF POND C-1 WATER COLUMN |
| Checked [illegible] 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved ______ Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5532B1.DWG | FIGURE 5-32B1 |




| | |
|---|---|
| Drawn NAM 8/9/95 Date | GROUP 2 CALIBRATION QUALITY of POND C-1 BOTTOM-SEDIMENT |
| Checked TJJ 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved ______ Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5532B2 DWG | FIGURE 5-32B2 |




| | |
|---|---|
| Drawn NAM 8/9/95 Date | GROUP 3 CALIBRATION QUALITY OF POND C-1 WATER COLUMN |
| Checked 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5532C1.DWG | FIGURE 5-32C1 |




| | |
|---|---|
| Drawn | 8/9/95 Date |
| Checked | 8/9/95 Date |
| Approved | Date |
| FILE OU5532C2.DWG | |

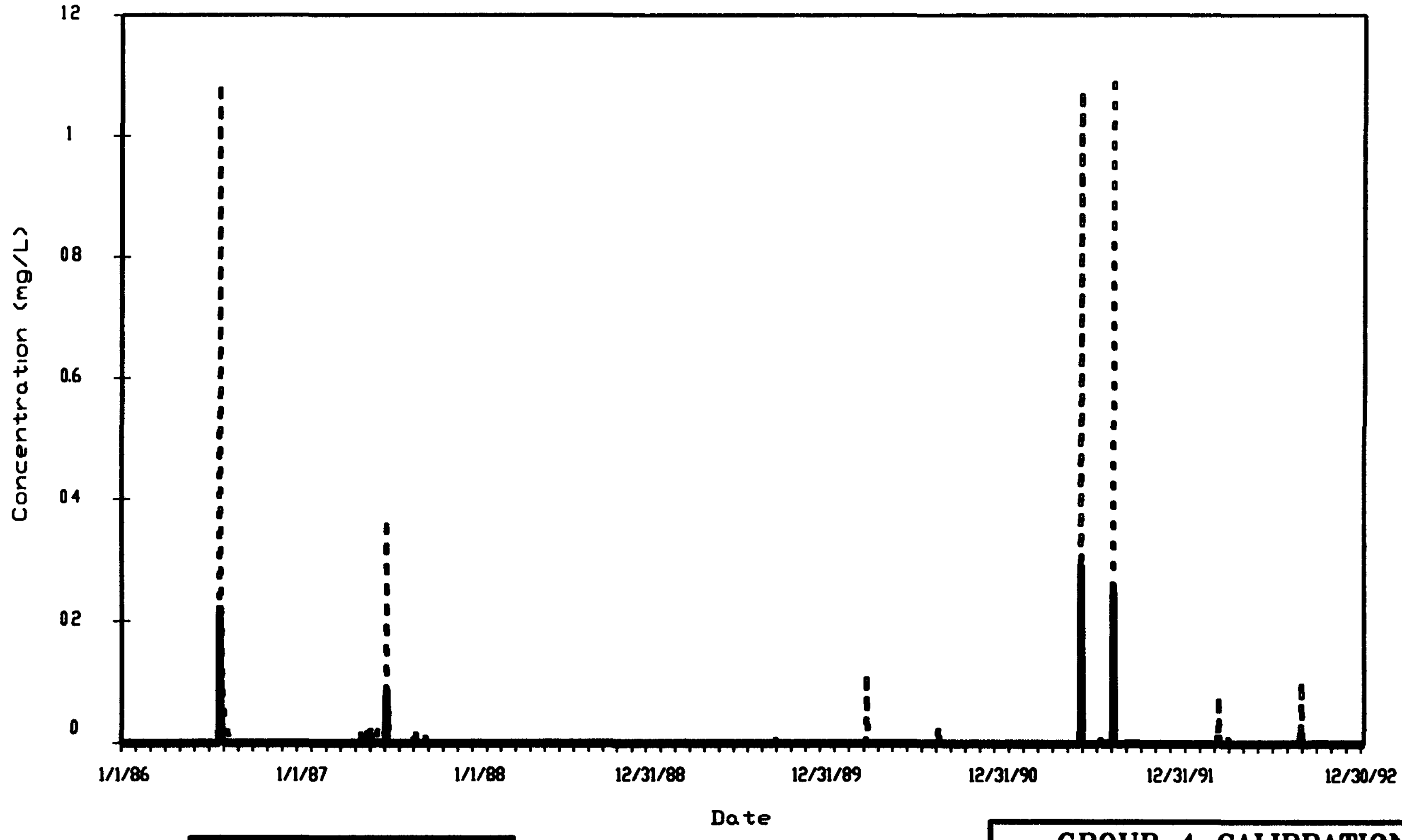
# GROUP 3 CALIBRATION QUALITY OF POND C-1 BOTTOM-SEDIMENT

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-32C2




Drawn NAM 8/9/95 Date

Checked 8/9/95 Date

Approved ______ Date

FILE OU5532D1 DWG

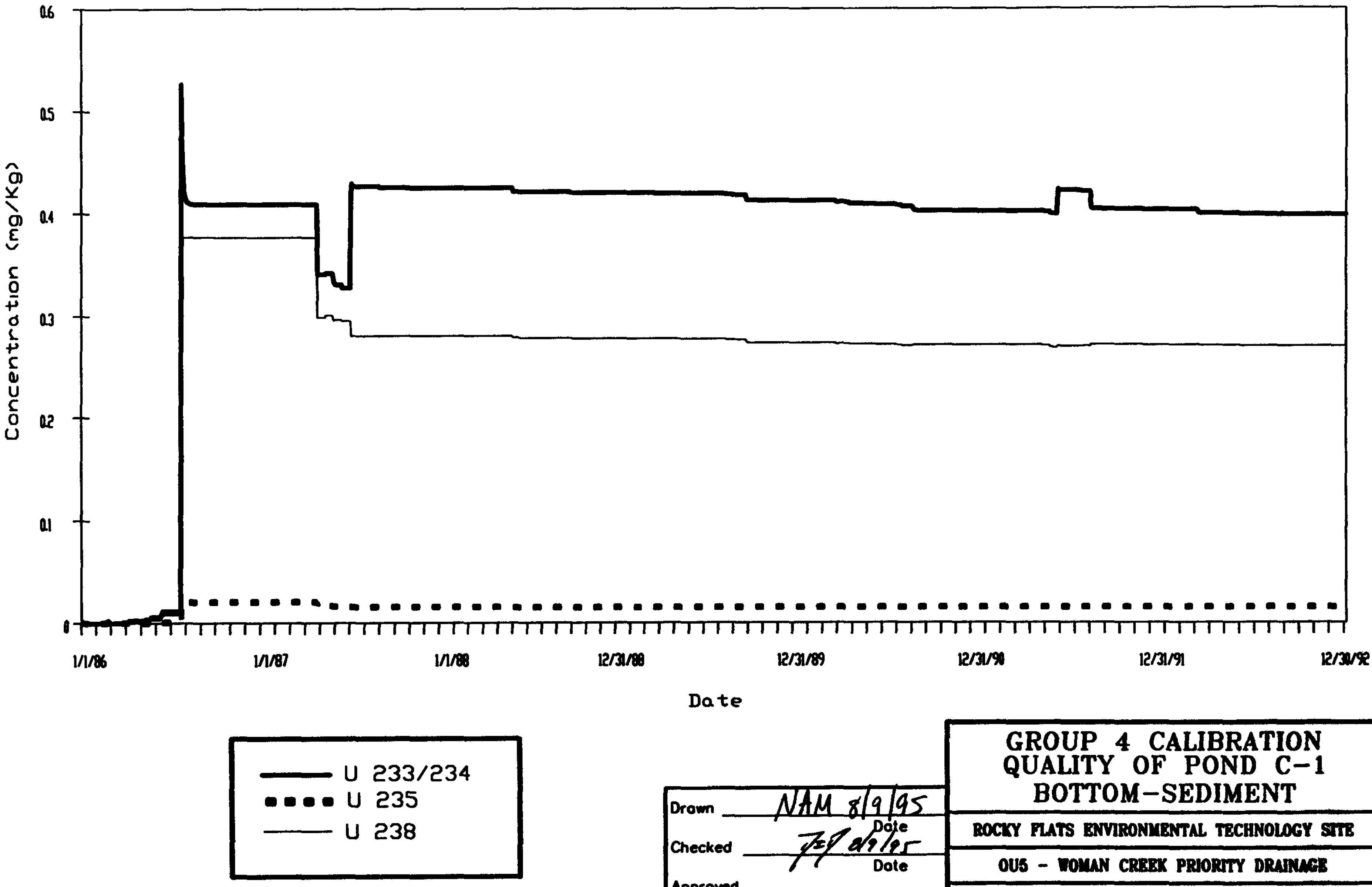
**GROUP 4 CALIBRATION QUALITY OF POND C-1 WATER COLUMN**

**ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE**

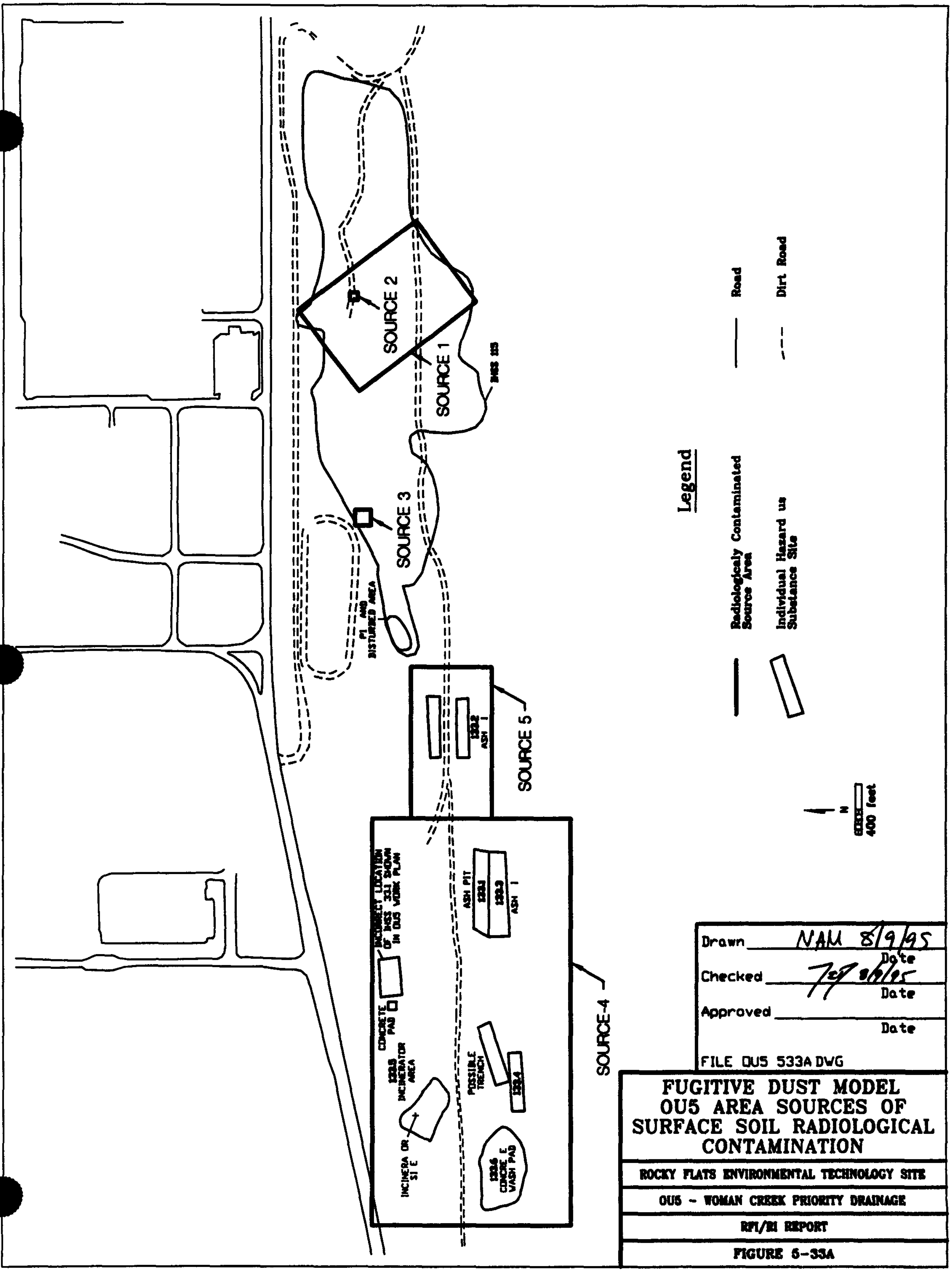
**OU5 - WOMAN CREEK PRIORITY DRAINAGE**

**RFI/RI REPORT**

**FIGURE 5-32D1**




| | |
|---|---|
| Drawn NAM 8/9/95 Date | GROUP 4 CALIBRATION QUALITY OF POND C-1 BOTTOM-SEDIMENT |
| Checked 8/9/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| Approved Date | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5532D2 DWG | FIGURE 5-32D2 |




Drawn NAM 8/9/95 Date

Checked [illegible] 8/9/95 Date

Approved ______ Date

FILE OU5 533A DWG

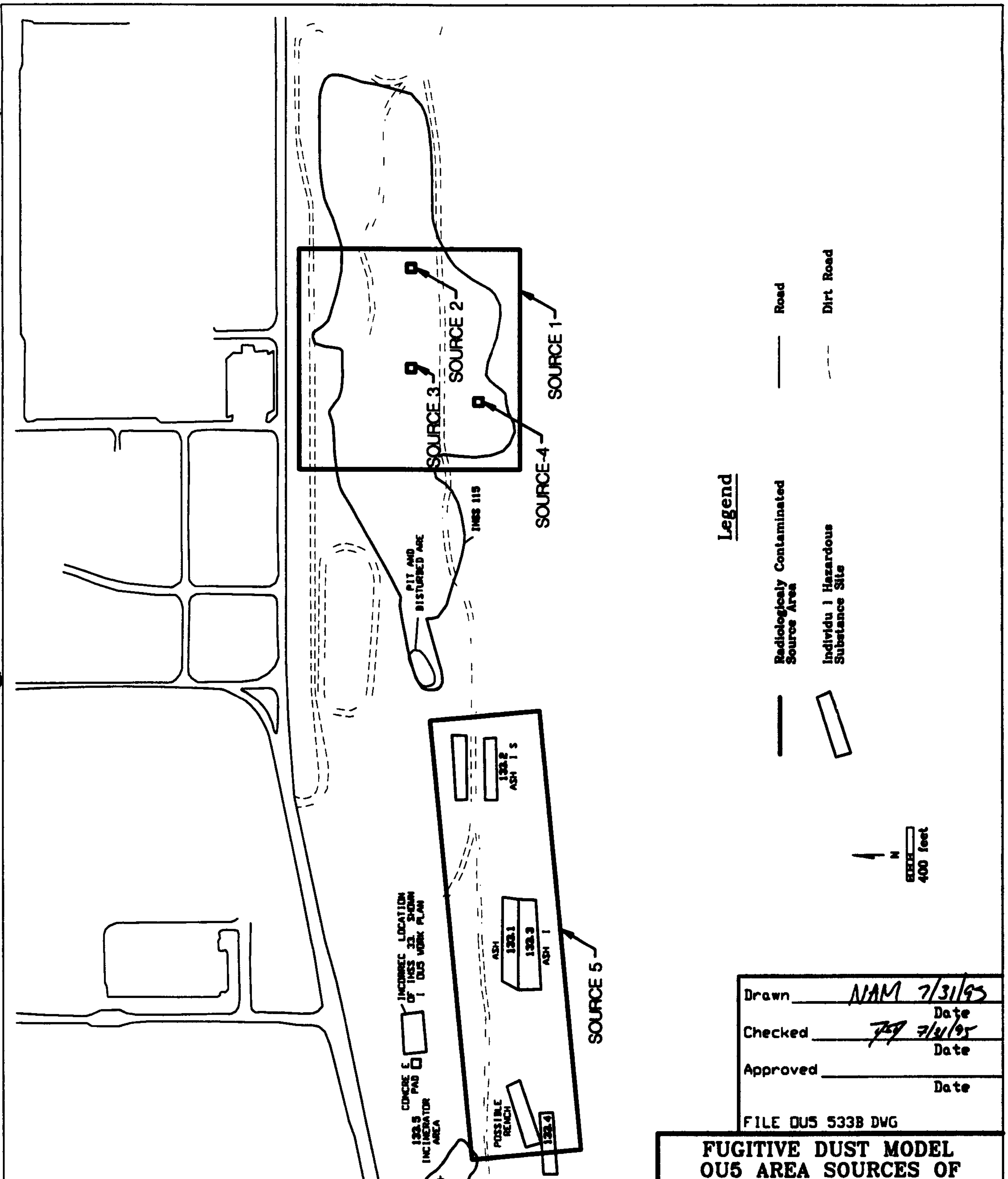
**FUGITIVE DUST MODEL OU5 AREA SOURCES OF SURFACE SOIL RADIOLOGICAL CONTAMINATION**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-33A




Drawn NAM 7/31/95 Date
Checked 7/31/95 Date
Approved ______ Date

FILE OU5 533B DWG

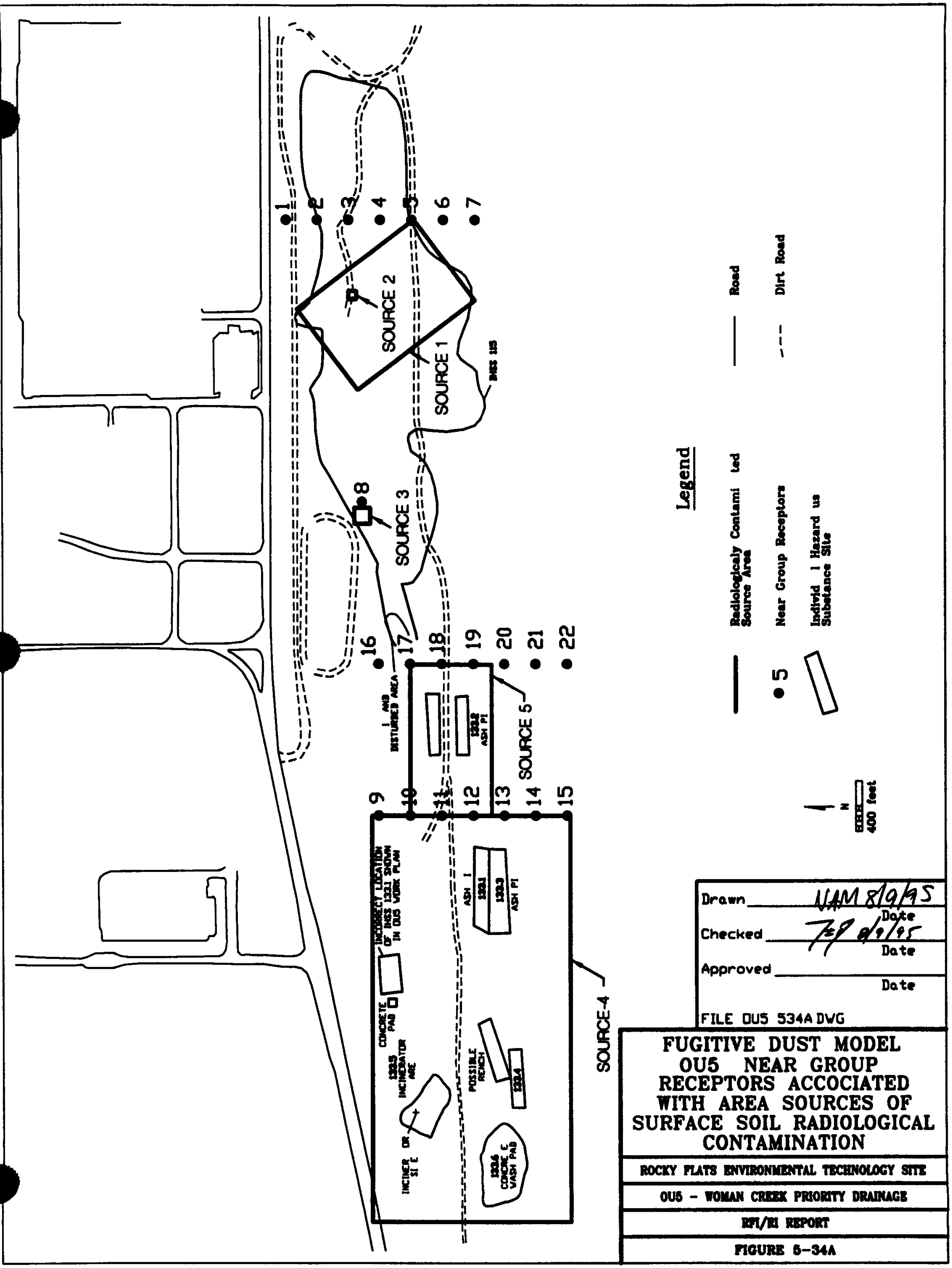
**FUGITIVE DUST MODEL OU5 AREA SOURCES OF SURFACE SOIL ORGANIC AND METAL CONTAMINATION**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-33B




Drawn VAM 8/9/95 Date

Checked 7EP 8/9/95 Date

Approved Date

FILE OU5 534A DWG

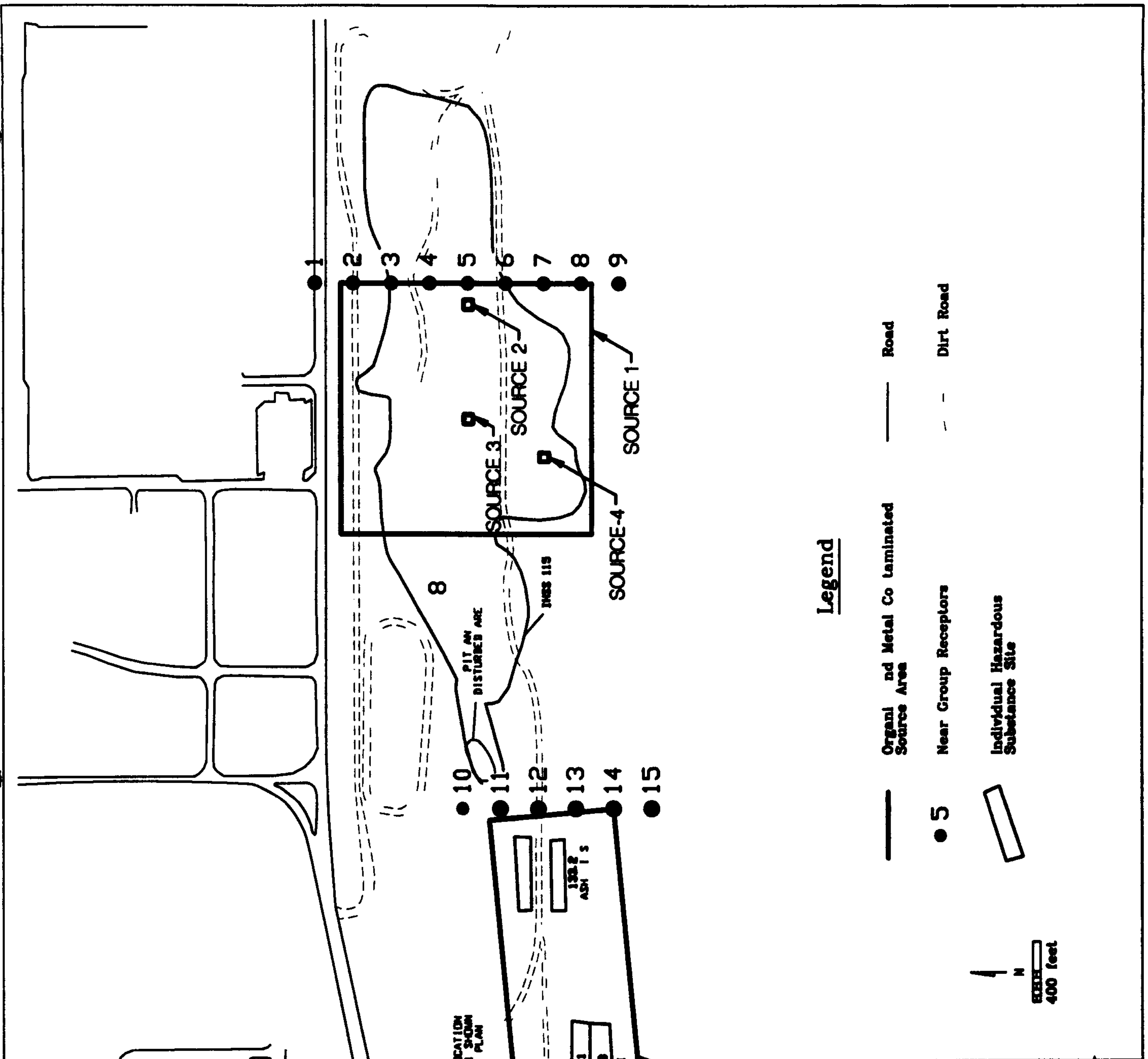
# FUGITIVE DUST MODEL OU5 NEAR GROUP RECEPTORS ACCOCIATED WITH AREA SOURCES OF SURFACE SOIL RADIOLOGICAL CONTAMINATION

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-34A




Drawn NAM 8/1/95
Date
Checked [illegible] 8/1/95
Date
Approved
Date

FILE OU5 534B DWG

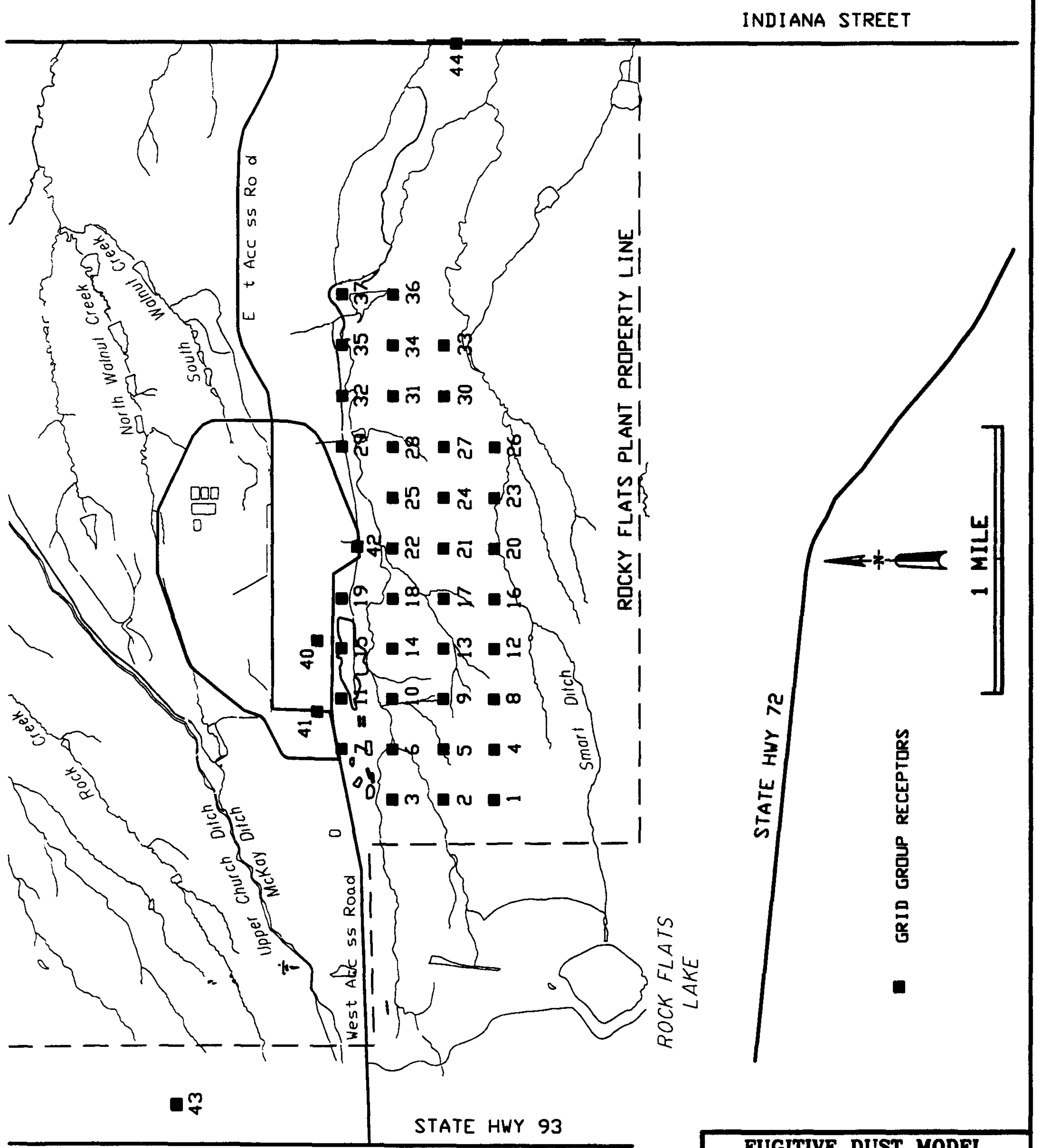
# FUGITIVE DUST MODEL OU5 NEAR GROUP" RECEPTORS ASSOCIATED WITH AREA SOURCES OF SURFACE SOIL ORGANIC AND METAL CONTAMINATION

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-34B




TO BOULDER

( fte USGS Q ds
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Dr wn NAM 7/31/95 Date
Chec ed 7/31/95 Date
Approved Date

FILE OU5 5 35.DWG

**FUGITIVE DUST MODEL**
**OU5 GRID GROUP" RECEPTORS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-35

## Table 5 1

### Initial Recharge Rates OU 5 Groundwater Flow Model

| Zone | Vegetation Type | Initial Recharge Rate ft/day | Initial Recharge Rate in/yr |
|---|---|---|---|
| 1 | Riparian Woodland | 5 2E-03 | 22 76 |
| 2 | Short Upland Shrub | 3 0E-03 | 13 04 |
| 3 | Open Water | 2 7E 03 | 11 65 |
| 4 | Tall Marsh Bottom Land Shrub | 2 3E-03 | 10 26 |
| 5 | Wet Meadow Short Marsh | 1 7E-03 | 7 48 |
| 6 | Mesic Mixed Grassland Short Grassland | 1 6E 03 | 7 17 |
| 7 | Reclaimed Grassland | 1 6E 03 | 7 17 |
| 8 | Xeric Mixed Grassland | 1 9E-03 | 8 50 |
| 9 | Disturbed Area/Barren Lands/Annual Grass/Forb | 2 1E 03 | 9 39 |

## Table 5 2

### Monthy Precipitation at Rocky Flats Plant

| Year | Month | Rain and Snowmelt Inches |
|---|---|---|
| 1993 | May | 1 13 |
| 1993 | June | 1 79 |
| 1993 | July | 0 48 |
| 1993 | August | 0 42 |
| 1993 | September | 1 58 |
| 1993 | October | 1 41 |
| 1993 | November | 1 27 |
| 1993 | December | 0 35 |
| 1994 | January | 0 45 |
| 1994 | February | 0 77 |
| 1994 | March | 1 05 |
| 1994 | Apnl | 4 03 |
| Total | | 14 73 |

From EG&G Monthly Environmental Monitonng Report, Rocky Flats Plant Reports May ER 4180110 219 through Apnl 1994 ER-4180110 222

## Table 5 3
## Estimated Consumptive Use Rates OU 5 Groundwater Flow Model

| Zone No | Plant Subcommunity | K | Consumptive-Use F | Uc | Soil Moisture Correction | Corrected Uc | Dominant Plants | Basis for K |
|---|---|---|---|---|---|---|---|---|
| Community Xeric Zone | | | | | | | | |
| 323 | Xeric Mixed Grassland | 0 70 | 26 95973308 | 18 87 | 0 33 | 6 23 | narrow leaf sedge blue gramma Kentucky blue grass sage | Shultz 1976 sage brush |
| Community Mesic Zone | | | | | | | | |
| 322 | Mesic Mixed Grassland | 0 85 | 26 95973308 | 22 92 | 0 33 | 7 56 | western wheatgrass | USDA 1970 small grains |
| 324 | Reclaimed Grassland | 0 85 | 26 95973308 | 22 92 | 0 33 | 7 56 | smooth brome wheat grasses sweet clover | USDA 1970 small grains |
| 410 | Disturbed Area Annual Grass/Forb | 0 85 | 26 95973308 | 22 92 | 0 33 | 7 56 | annual sunflower sweet clover | USDA 1970 Ladono Whitecover |
| 420 | Disturbed Area Barren Lands | 0 60 | 26 95973308 | 16 18 | 0 33 | 5 34 | roads | Less than sage brush |
| Community Hydric Zone | | | | | | | | |
| 110 | Riparian Woodland | 1 35 | 26 95973308 | 36 40 | 1 03 | 37 49 | cottonwoods willows | Shultz 1976 cottonwood willows |
| 220 | Short Upland Shrub (Snowberry) | 1 00 | 26 95973308 | 26 96 | 1 03 | 27 77 | snowberry canada bluegrass | Shultz 1976 small willows |
| 10 | Wet Meadow (Grasses) | 0 80 | 26 95973308 | 21 57 | 1 03 | 22 21 | prairie shortgrass sedges | Shultz 1976 light vegetation |
| 30 | Tall Marsh (Cattails) | 0 90 | 26 95973308 | 24 26 | 1 03 | 24 99 | cattails, bulrushes | Shultz 1976 seeped areas |
| 40 | Open Water | 0 95 | 26 95973308 | 25 61 | 1 03 | 26 38 | impoundments | Shultz 1976 water surfaces |

Notes
1 Zone numbers refer to DOE (1992c)
2 Calculated from Uc=K F
3 F = Consumptive Use Factor sum of the monthly consumptive use factors for each month during the growing season May 15 September 30 1993

## Table 5-4

### Calibration Results Primary Target Wells
### OU 5 Groundwater Flow Model

| Well | X_Grid | Y_Grid | Column | Row | Observed | Calculated | (CAL -OBS ) |
|---|---|---|---|---|---|---|---|
| 5686 | 2220 | 1308 | 36 | 23 | 5982 3 | 5982 | -0 25 |
| 6586 | 9501 | 469 | 132 | 7 | 5781 7 | 5782 | 0 23242 |
| 7086 | 4003 | 859 | 72 | 15 | 5935 6 | 5935 3 | -0 2666 |
| 51193 | 8379 | 575 | 120 | 9 | 5812 | 5812 | -0 02002 |
| 58793 | 2605 | 838 | 44 | 15 | 5998 7 | 5998 9 | 0 26855 |
| 59493 | 3536 | 526 | 63 | 9 | 5985 2 | 5985 3 | 0 10449 |
| 59593 | 3786 | 773 | 68 | 13 | 5942 7 | 5943 | 0 26563 |

Number of Active Observation Points = 7
Mean of Residuals = 0 047782
Standard Deviation of Residuals (SDEV) = 0 232957
Mean of Absolute Residuals (MA) = 201102
Root Mean Squared Residuals (RMS) = 0 220905
Correlation Coefficient = 0 999997

**Table 5-5**
**Calibration Results Secondary Wells and Wellpoints**
**OU 5 Groundwater Flow Model**

| Well | X_Grid | Y_Grid | Column | Row | Observed | Calculated | (CAL OBS) |
|---|---|---|---|---|---|---|---|
| 5886 | 5435 | 1266 | 91 | 23 | 5891 6 | 5891 5 | -0 1001 |
| 6886 | 5582 | 1196 | 92 | 22 | 5886 7 | 5887 2 | 0 45654 |
| 5786 | 3572 | 791 | 63 | 14 | 5947 | 5948 4 | 1 356 |
| 6486 | 7610 | 678 | 113 | 12 | 5833 4 | 5834 3 | 0 84912 |
| 59093 | 1327 | 999 8 | 19 | 18 | 6010 | 6012 2 | 2 1162 |
| 59393 | 3489 | 794 8 | 62 | 14 | 5947.2 | 5951.2 | 3.9731 |
| 59793 | 4128 | 797 4 | 75 | 14 | 5932 1 | 5934 6 | 2 4805 |
| 63093 | 1751 | 992 8 | 27 | 18 | 5998 7 | 6005.2 | 6 4565 |
| 59993 | 4132 | 799 9 | 75 | 14 | 5935 3 | 5934 3 | -0 94678 |
| 60293 | 3847 | 753 9 | 69 | 13 | 5942 4 | 5942.2 | -0.27393 |
| 60593 | 2973 | 673.7 | 51 | 11 | 6002 | 6000 9 | 1 1235 |
| 60693 | 2896 | 664 9 | 50 | 11 | 6008 1 | 6001 6 | -6.54 |
| 60893 | 3585 | 506 7 | 64 | 8 | 5985 1 | 5983 | 2 0303 |
| 62593 | 1457 | 730 4 | 21 | 13 | 6043 6 | 6040 9 | 2 7148 |
| 62693 | 1926 | 723 | 31 | 12 | 6037 9 | 6037 9 | 7 76E-02 |
| 62793 | 4304 | 803 | 78 | 14 | 5935 6 | 5930 4 | 5.2026 |
| 62893 | 4700 | 385 9 | 83 | 6 | 5994 | 5991 8 | 2 1597 |
| 63593 | 2603 | 836.2 | 44 | 15 | 5997 3 | 5999 1 | 1 7725 |
| 63693 | 2608 | 848 | 44 | 15 | 5996 9 | 5998 5 | 1 6641 |
| 63793 | 2611 | 835 4 | 44 | 15 | 5998 3 | 5998 9 | 0 63037 |
| 63893 | 3536 | 521 9 | 63 | 8 | 5982 3 | 5985 6 | 3 3853 |
| 63993 | 3115 | 528 4 | 54 | 9 | 6001 4 | 6004 7 | 3 3301 |
| 64093 | 3124 | 532.1 | 54 | 9 | 6002 4 | 6004 1 | 1 7188 |
| 51293 | 314 8 | 1103 | 4 | 20 | 6041 | 6040 5 | -0.5 |
| 51393 | 1057 | 1036 | 13 | 19 | 6020 | 6020 1 | 0 12646 |
| 51693 | 2102 | 1203 | 34 | 22 | 5986 | 5989 | 2 9878 |
| 52193 | 2102 | 1105 | 34 | 20 | 5998 | 5998 4 | 1 5933 |
| 53993 | 7058 | 736 | 107 | 13 | 5848 | 5848 | 0 |
| 54093 | 7052 | 708 1 | 107 | 12 | 5849 | 5848 6 | -0 35449 |
| 54193 | 7046 | 681 | 107 | 12 | 5857 | 5851 3 | 5 6982 |
| 54693 | 9123 | 412 8 | 128 | 6 | 5792 | 5793.2 | 1.2485 |
| 51493 | 1717 | 1067 | 26 | 19 | 6000 7 | 6000 5 | -0.2002 |
| 51593 | 2102 | 1290 | 34 | 23 | 5985 7 | 5986.2 | 0 47461 |
| 51793 | 2104 | 1184 | 34 | 22 | 5989 6 | 5990 5 | 0 87109 |
| 51893 | 2105 | 1165 | 34 | 21 | 5993 6 | 5992 | 1 6172 |
| 51993 | 2103 | 1145 | 34 | 21 | 5994 3 | 5993 5 | -0 771 |
| 52093 | 2103 | 1125 | 34 | 20 | 5996 4 | 5995 | 1 4038 |
| 52593 | 2671 | 1314 | 45 | 23 | 5970 9 | 5970 | -0 8999 |
| 52693 | 3505 | 806.2 | 62 | 14 | 5946.2 | 5949 | 2 8433 |
| 52793 | 4003 | 908 4 | 72 | 16 | 5935 1 | 5935 | -6 49E-02 |
| 52893 | 4002 | 831 8 | 72 | 15 | 5936 4 | 5935 7 | -0 74121 |
| 52993 | 4002 | 787 4 | 72 | 14 | 5936 7 | 5937 | 0.2959 |
| 53093 | 4005 | 755 9 | 72 | 13 | 5937 7 | 5939.2 | 1 4707 |
| 53293 | 4004 | 692.9 | 72 | 12 | 5956 2 | 5956 6 | 0 396 |
| 53393 | 4736 | 850.2 | 84 | 15 | 5916 | 5917 5 | 1 5 |
| 53493 | 5174 | 1154 | 88 | 21 | 5898 8 | 5899 5 | 0 7002 |
| 53593 | 5950 | 1127 | 96 | 21 | 5875 3 | 5876 8 | 1 4502 |
| 54393 | 7034 | 640 9 | 107 | 11 | 5858 6 | 5855 | -3.5596 |
| 54493 | 7025 | 607 7 | 107 | 10 | 5863 6 | 999 99 | dry cell |
| 54793 | 9876 | 506 1 | 135 | 8 | 5773 | 5773 | 0 |

Number of Active Observation Points 49
Mean of Residuals (M) 0 1220504
*Standard Deviation of Residuals (SDEV)* 2.378982
Mean of Absolute Residuals (MA) 1 698468

Root Mean Sq ared Residuals (RMS) 2.357743
Correlatio Coefficient 0 9993236
Probab ty of U Correlation 0

**Table 5-6**

**Hydraulic Conductivities**
**OU 5 Groundwater Flow Model**

| Zone | Hydraulic Conductivity ft/day | Effective Porosity | Zone | Hydraulic Conductivity ft/day | Effective Porosity |
|---|---|---|---|---|---|
| 1 | 1 43E 02 | 0 01 | 14 | 5 14E-01 | 0 03 |
| 2 | 3 57E 02 | 0 01 | 15 | 6 29E 01 | 0 03 |
| 3 | 5 29E 02 | 0 01 | 16 | 8 23E-01 | 0 04 |
| 4 | 7 14E 02 | 0 01 | 17 | 8 57E 01 | 0 04 |
| 5 | 7 40E 02 | 0 01 | 18 | 9 29E-01 | 0 04 |
| 6 | 1 57E 01 | 0 01 | 19 | 1 00E+00 | 0 04 |
| 7 | 1 65E 01 | 0 01 | 20 | 2 86E+00 | 0 12 |
| 8 | 2 27E-01 | 0 01 | 21 | 4 94E+00 | 0 15 |
| 9 | 2 86E 01 | 0 01 | 22 | 7 14E+00 | 0 18 |
| 10 | 3 57E 01 | 0 02 | 23 | 1 00E+01 | 0 18 |
| 11 | 3 70E 01 | 0 02 | 24 | 1 43E+01 | 0 18 |
| 12 | 4 29E 01 | 0 02 | 25 | 2 86E+01 | 0 19 |
| 13 | 5 00E-01 | 0 03 | | | |

## Table 5 7

### Recharges Rates from Calibration of OU 5 Groundwater Model

| Zone | Recharge Rate (Feet per Day) |
|---|---|
| 1 | 0 000742856 |
| 2 | 0 000442857 |
| 3 | 0 000385714 |
| 4 | 0 000342857 |
| 5 | 0 000242857 |
| 6 | 0 000228571 |
| 7 | 0 000242857 |
| 8 | 0 000271428 |
| 9 | 0 0003 |

**Table 5 8**

**Volumetric Budget**
**OU 5 Groundwater Flow Model**

| | |
|---|---|
| Inflow Cubic Feet/Day | |
| From Constant Head Cells = | 15 556 |
| Recharge = | 8 920 |
| Total Inflow = | 24 476 |
| Outflow Cubic Feet/Day | |
| To Constant Head Cells = | 22 670 |
| Negative Recharge (phreatophytes) = | 1 852 8 |
| Total Outflow = | 24 522 |
| Inflow Outflow Cubic Feet/Day | -46 502 |
| Percent Discrepancy | -0 19 |

## Table 5 9
## Summary of Screening for Target Well Selection
## OU 5 Solute Transport Model

| Well Number | Chemical of Concern | Units | Background Mean | Mean Plus 2 St Dev | Well Maximum | Mean | Target Well? |
|---|---|---|---|---|---|---|---|
| | Aluminum | ug/l | 72.24 | 231 57 | 9 | 9 | No |
| | Americium-241 | pCi/l | 0 02 | 0 1 | NA | NA | No |
| | Barium | ug/l | 84 23 | 154 76 | 156 | 156 | Yes |
| | Beryllium | ug/l | 2 33 | 5 1 | 0 5 | 0 5 | No |
| | Manganese | ug/l | 22 91 | 128 92 | 0 5 | 0 5 | No |
| 50092 | Plutonium-239/240 | pCi/l | 0 01 | 0 01 | NA | NA | No |
| | Radium-226 | pCi/l | 0 26 | 0 48 | 0 55 | 0 47 | Yes |
| | Uranium-233/234 | pCi/l | 6 1 | 19 08 | 5 9 | 5 16 | No |
| | Uranium-235 | pCi/l | 0 23 | 0 65 | 0 39 | 0 33 | No |
| | Uranium-238 | pCi/l | 4 31 | 13 65 | 3 5 | 3 19 | No |
| | Vanadium | ug/l | 13 03 | 45 06 | NA | NA | No |
| | Aluminum | ug/l | 72.24 | 231 57 | 100 | 41 4 | No |
| | Americium-241 | pCi/l | 0 02 | 0 1 | 0 004 | 0 002 | No |
| | Barium | ug/l | 84.23 | 154 76 | 257 | 236 63 | Yes |
| | Beryllium | ug/l | 2 33 | 5 1 | 2 5 | 1 5 | No |
| | Manganese | ug/l | 22 91 | 128 92 | 3005 | 2900 | Yes |
| 51193 | Plutonium-239/240 | pCi/l | 0 01 | 0 01 | 0 0005 | -0 002 | No |
| | Radium-226 | pCi/l | 0 26 | 0 48 | NA | NA | No |
| | Uranium-233/234 | pCi/l | 6 1 | 19 08 | 0 49 | 0 36 | No |
| | Uranium-235 | pCi/l | 0 23 | 0 65 | 0 09 | 0 06 | No |
| | Uranium-238 | pCi/l | 4 31 | 13 65 | 0 59 | 0 34 | No |
| | Vanadium | ug/l | 13 03 | 45 06 | 25 | 13.5 | No |
| | Aluminum | ug/l | 72.24 | 231 57 | 100 | 73 33 | No |
| | Americium-241 | pCi/l | 0 02 | 0 1 | 0 018 | 0 008 | No |
| | Barium | ug/l | 84.23 | 154 76 | 156 | 155 | Yes |
| | Beryllium | ug/l | 2 33 | 5 1 | 2 5 | 1 83 | No |
| | Manganese | ug/l | 22.91 | 128 92 | 515 | 490 67 | Yes |
| 58793 | Plutonium-239/240 | pCi/l | 0 01 | 0 01 | 0 002 | 0 001 | No |
| | Radium-226 | pCi/l | 0.26 | 0 48 | 0 55 | 0 55 | Yes |
| | Uranium-233/234 | pCi/l | 6 1 | 19 08 | 0 87 | 0 55 | No |
| | Uranium-235 | pCi/l | 0.23 | 0 65 | 0 04 | 0 01 | No |
| | Uranium-238 | pCi/l | 4 31 | 13 65 | 1 1 | 0 67 | No |
| | Vanadium | ug/l | 13 03 | 45 06 | 25 | 17 5 | No |
| | Aluminum | ug/l | 72.24 | 231 57 | 100 | 43 | No |
| | Americium-241 | pCi/l | 0 02 | 0 1 | 0 005 | 0 001 | No |
| | Barium | ug/l | 84.23 | 154 76 | 647 | 486 67 | Yes |
| | Beryllium | ug/l | 2 33 | 5 1 | 2.5 | 1 17 | No |
| | Manganese | ug/l | 22.91 | 128 92 | 10500 | 6130 | Yes |
| 59493 | Plutonium-239/240 | pCi/l | 0 01 | 0 01 | 0 002 | 0 002 | No |
| | Radium-226 | pCi/l | 0.26 | 0 48 | 1 03 | 1 03 | Yes |
| | Uranium-233/234 | pCi/l | 6 1 | 19 08 | 2 1 | 1 99 | No |
| | Uranium-235 | pCi/l | 0.23 | 0 65 | 0 16 | 0 08 | No |
| | Uranium-238 | pCi/l | 4 31 | 13 65 | 1 9 | 1 72 | No |
| | Vanadium | ug/l | 13 03 | 45 06 | 25 | 11 03 | No |
| | Aluminum | ug/l | 72.24 | 231 57 | 37 7 | 22.23 | No |
| | Americium-241 | pCi/l | 0 02 | 0 1 | 0 006 | 0 006 | No |
| | Barium | ug/l | 84.23 | 154 76 | 139 | 121 | No |
| | Beryllium | ug/l | 2.33 | 5 1 | 0 5 | 0 5 | No |
| | Manganese | ug/l | 22.91 | 128 92 | 761 | 575 67 | Yes |
| 59593 | Plutonium-239/240 | pCi/l | 0 01 | 0 01 | 0 001 | 0 001 | No |
| | Radium-226 | pCi/l | 0.26 | 0 48 | 0 56 | 0 56 | Yes |
| | Uranium-233/234 | pCi/l | 6 1 | 19 08 | 3 5 | 2 57 | No |
| | Uranium-235 | pCi/l | 0 23 | 0 65 | 0 37 | 0.2 | No |
| | Uranium-238 | pCi/l | 4 31 | 13 65 | 3 6 | 2.23 | No |
| | Vanadium | ug/l | 13 03 | 45 06 | 2 5 | 2 17 | No |

**Table 5 10**
**Target Concentrations OU 5 Solute Transport Model**

| Constituent | Well Number | Background Mean Concentration (BM) | Well Mean Concentration (WM) | Target Concentration (BM WM) |
|---|---|---|---|---|
| Barium | 50092 | 84 23 | 156 | 71 77 |
| in ug/l | 51193 | 84 23 | 236 63 | 152 40 |
| | 58793 | 84 23 | 155 | 70 77 |
| | 59493 | 84 23 | 486 67 | 402 44 |
| | 59593 | 84 23 | 121 | 36 77 |
| Manganese | 51193 | 22 91 | 2 900 | 2 877 09 |
| in ug/l | 58793 | 22 91 | 490 67 | 467 76 |
| | 59493 | 22 91 | 6 130 | 6 107 09 |
| | 59593 | 22 91 | 575 67 | 552 76 |
| Radium 226 | 50092 | 0 26 | 0 47 | 0 21 |
| in pCi/l | 58793 | 0 26 | 0 55 | 0 29 |
| | 59493 | 0 26 | 1 03 | 0 77 |
| | 59593 | 0 26 | 0 56 | 0 30 |

**Table 5 11**
**Calibration Results OU 5 Solute Transport Models**

| Chemical of Concern | Well Number | Target Concentration ug/l and pCi/l | Computed Concentration ug/l and pCi/l | Distribution Coefficient ml/g | Source Concentration ug/l and pCi/l |
|---|---|---|---|---|---|
| Barium | 58793 | 70 77 | 72 39 | 0 624 | 2912 5 |
| | 59493 | 402 44 | 402 43 | 0 624 | 47859 |
| | 59593 | NA | 171 6 | 0 624 | 47859 |
| | 51193 | 152 4 | 152 4 | 0 624 | 152 49 |
| | 50092 | 71 77 | 71 77 | 0 624 | 93 868 |
| Manganese | 58793 | 467 76 | 510 1 | 3 059 | 291030 |
| | 59493 | 6107 09 | 6113 8 | 3 059 | 973180 |
| | 59593 | 552 76 | 558 1 | 3 059 | 973180 |
| | 51193 | 2877 09 | 2877 09 | 3 059 | 3663 |
| | 50092 | NA | NA | NA | NA |
| Radium 226 | 58793 | 0 29 | 29 79 | 0 687 | 12 679 |
| | 59493 | 0 77 | 76 54 | 0 687 | 106 72 |
| | 59593 | 0 3 | 35 25 | 0 687 | 106 72 |
| | 51193 | NA | NA | NA | NA |
| | 50092 | 0 21 | 0 21 | 0 687 | 0 29345 |

**Table 5-12**
**Thrity Year Furture Concentrations at Woman Creek**
**OU 5 Groundwater Modeling**

| Constituent | Location of Greatest 30 Year Concentration Column | Row | Greatest Thirty Year Concentration pCi/L or ug/L |
|---|---|---|---|
| Radium 226 | 120 | 11 | 0 27 |
| Barium | 70 | 15 | 93 |
| Manganese | 120 | 9 | 3451 |

**Table 5-13**
**Worst-Case Furture Concentrations at Woman Creek**
**OU 5 Groundwater Modeling**

| Constituent | Location of Worst Case Concentration Column | Row | Steady State Concentration pCi/L or ug/L | Uncertainty Ratio | Worst-Case Concentration pCi/L or ug/L |
|---|---|---|---|---|---|
| Radium 226 | 49 | 20 | 0 26 | 10 | 2 6 |
| Barium | 70 | 15 | 93 | 1 71 | 159 |
| Manganese | 49 | 20 | 5911 | 1 1 | 6517 |

**Table 5-14**
**Geometric Properties of HSPF10 Sub-Basins and Stream Reaches**

| Sub Basin | Calibration Basin Area (Acres) | Simulation Basin Area (Acres) | Reach Length (Feet) | Comments |
|---|---|---|---|---|
| Basin 1 | 364 2 | 364 2 | None | Located west of South Boulder Diversion Canal (SBDC) |
| Basin 2 | 301 0 | 301 0 | 5 801 | Extends eastward to the west boundary of RFETS (GS05) |
| Basin 3 | 494 4 | 557 8 | 5 961 | Extends eastward to the confluence with Antelope Spring Creek |
| Basin 4 | 51 3 | 97 2 | 1 806 | Extends eastward to GS17 (inflow to Pond C 1) |
| Basin 5 | 50 1 | 82 3 | 1 033 | Extends through Pond C 1 to GS07 (outflow of Pond C 1) |
| Basin 6 | 603 4 | 643 9 | 10 392 | Extends eastward to Indiana Street (GS02) |
| Totals | 1 864 4 | 2 046 4 | 24 993 | |

**Table 5 15**

**Monthly and Annual Precipitation at Rocky Flats Environmental Technology Site (inches)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1971 | | | | | | 0.22 | 1.11 | 0.35 | 3.17 | 0.55 | 0.15 | 0.40 | |
| 1972 | 0.93 | 0.08 | 0.83 | 1.58 | 0.97 | 0.95 | 1.59 | 2.47 | 1.42 | 0.91 | 2.00 | 1.05 | 14.78 |
| 1973 | 1.05 | 0.15 | 2.04 | 4.73 | 4.71 | 0.66 | 1.53 | 0.54 | 2.74 | 0.65 | 1.30 | 1.48 | 21.58 |
| 1974 | 1.12 | 1.11 | 0.89 | 3.05 | 0.08 | 1.99 | 1.00 | 0.22 | 1.41 | 1.91 | 1.15 | 0.38 | 14.31 |
| 1975 | 0.38 | 0.84 | 1.42 | 1.31 | 3.73 | 1.11 | 0.83 | 1.22 | 0.80 | 0.68 | 0.85 | 0.21 | 13.38 |
| 1976 | 0.13 | 0.04 | 0.34 | 2.16 | 1.93 | 0.90 | 1.53 | 1.46 | 4.49 | 0.66 | 0.21 | 0.10 | 13.95 |
| 1977 | 0.06 | 0.47 | 0.08 | 1.80 | 0.46 | 1.13 | 2.73 | 1.04 | 0.12 | 0.40 | 0.34 | 0.09 | 8.72 |
| 1978 | 0.35 | 0.33 | No published data found for this time period | | | | | | | | | | |
| 1979 | | | | | | | | | | | | | |
| 1980 | | | | | | | | | | | | | |
| 1981 | | | | | | | | | | | | | |
| 1982 | | | | | | | | | | | | | |
| 1983 | 0.02 | 0.1[illegible] | 4.64 | 2.21 | 3.97 | 2.76 | 2.10 | 3.46 | 0.01 | 0.34 | 2.47 | 0.42 | 22.59 |
| 1984 | 0.36 | 0.65 | 0.84 | 1.42 | 0.56 | 0.91 | 0.77 | 1.69 | 0.16 | 3.68 | 0.00 | 0.28 | 11.32 |
| 1985 | 0.41 | 0.77 | 0.64 | 1.6[illegible] | 2.[illegible]2 | 1.73 | 3.38 | 0.11 | 1.24 | 0.00 | 1.26 | 0.08 | 14.23 |
| 1986 | 0.06 | 0.[illegible]3 | 0.00 | 2.68 | 2.23 | 2.03 | 1.46 | 1.58 | 0.84 | 0.98 | 0.[illegible]8 | 1.26 | 15.03 |
| 1987 | 0.43 | 1.19 | 1.35 | 0.91 | 2.40 | 5.72 | 0.57 | 2.09 | 0.64 | 1.06 | 1.10 | 0.71 | 18.17 |
| 1988 | 0.27 | 0.55 | 1.10 | 1.22 | 2.20 | 0.95 | 1.66 | 1.60 | 1.36 | 0.09 | 0.40 | 0.54 | 11.94 |
| 1989 | 0.53 | 0.11 | 0.21 | 0.51 | 2.20 | 0.02 | 1.74 | 1.90 | 2.69 | 0.39 | 0.11 | 0.31 | 10.72 |
| 1990 | 0.28 | 0.17 | 2.16 | 1.33 | 1.82 | 0.12 | 3.16 | 1.41 | 2.00 | 0.80 | 0.64 | 0.02 | 13.91 |
| 1991 | 0.19 | 0.04 | 0.41 | 1.50 | 3.77 | 2.30 | 2.47 | 2.45 | 0.84 | 0.31 | 1.72 | 0.17 | 16.17 |
| 1992 | 0.31 | 0.00 | 3.37 | 0.53 | 1.51 | 2.21 | 1.10 | 2.97 | 0.00 | 0.59 | 1.00 | 0.11 | 13.70 |
| 1993 | 0.03 | 0.27 | 1.52 | 1.45 | 1.13 | 1.79 | 0.48 | 0.42 | 1.58 | 1.41 | 1.27 | 0.35 | 11.70 |
| 1994 | 0.45 | 0.77 | 1.05 | 4.03 | 1.37 | 1.12 | 0.4 | 1.5 | 0.68 | 0.96 | 1.08 | 0.16 | 13.57 |
| Median | 0.35 | 0.33 | 0.97 | 1.54 | 1.93 | 1.13 | 1.53 | 1.54 | 1.04 | 0.67 | 1.04 | 0.30 | 13.93 |
| Mean | 0.39 | 0.46 | 1.27 | 1.90 | 2.00 | 1.51 | 1.56 | 1.50 | 1.38 | 0.86 | 0.95 | 0.43 | 14.43 |
| Std Dev | 0.33 | 0.39 | 1.19 | 1.12 | 1.36 | 1.28 | 0.88 | 0.93 | 1.19 | 0.82 | 0.67 | 0.42 | 3.50 |
| Maximum | 1.12 | 1.19 | 4.64 | 4.73 | 4.71 | 5.72 | 3.38 | 3.46 | 4.49 | 3.68 | 2.47 | 1.48 | 22.5[illegible] |
| Minimum | 0.02 | 0.00 | 0.00 | 0.51 | 0.00 | 0.02 | 0.40 | 0.11 | 0.00 | 0.00 | 0.00 | 0.02 | 8.72 |
| N | 18 | 18 | 17 | 17 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 17 |

Sou[illegible] [illegible]G&G Rocky Flats Inc

N[illegible] Bl[illegible]k pac[illegible] [illegible]ean [illegible]o data [illegible]ilable

**Table 5-16**
**Summary of Chemicals of Concern by Medium**

| Group | Chemical of Concern | Surface Soil | Ground Water | Surface Water | Pond Sediment | Stream Sediment |
|---|---|---|---|---|---|---|
| **Metals** | | | | | | |
| 1 | Barium | | X | X | | |
| | Lithium | | | X | | |
| | Strontium | | | X | | |
| 2 | Copper | X | | | | X |
| | Mercury | X | | | X | X |
| | Zinc | | | | X | X |
| **Radionuclides** | | | | | | |
| 3 | Americium 241 | | X | X | X | X |
| | Plutonium 239/240 | | X | | X | X |
| 4 | Uranium 233/234 | X | X | X | X | |
| | Uranium 235 | X | X | | X | |
| | Uranium-238 | X | X | X | X | |

Source DOE 1995a

## Table 5-17

### OU5 Surface-Water Gauge Stations (GS) for Woman Creek Drainage Basin

| Site | Purpose/Location[1] | Equipment | Flow Equation[2] |
|---|---|---|---|
| GS05 | West boundary of RFETS on Woman Creek | 9 Parshall Flume<br>Flow Recorder | $CFS = 3\ 1667(FT^{1\ 5128})$ |
| GS06 | West boundary of RFETS on South Woman Creek | 9 Parshall Flume<br>Flow Recorder | $CFS = 3\ 1667(FT^{1\ 5128})$ |
| GS17 | Flow into Pond C 1 and seepage from SID | 9 Parshall Flume<br>Flow Recorder | $CFS = 3\ 1667(FT^{1\ 5128})$ |
| GS07 | Discharge from Pond C 1 | 9 Parshall Flume<br>90 V Notch Weir<br>Flow Recorder | $CFS = 3\ 1667(FT^{1\ 5128})$ |
| GS01 | Indiana Street | Rated Culvert<br>43 X 78 CMP<br>Flow Recorder | $CFS = 11\ 05(FT^5)+30\ 87(FT^4)+26\ 63(FT^3)+10\ 35(FT^2)+0\ 22(FT)+0\ 00019$ |
| GS02 | Indiana Street | Rated Culvert<br>36 CMP<br>Flow Recorder | $CFS = 0\ 06067(FT^3)+5\ 0093(FT^2)+1\ 0656(FT)$ |

NOTES
1) Locations are shown on Figure 5 3 2 2
2) Source EG&G 1994d
CMP = corrugated metal pipe CFS = cubic feet per second FT = feet (depth of flow)

## Table 5 18

## Woman Creek Observed Total Suspended Sediment (TSS) Concentrations

| Date | Sample Location | Concentration (mg/L) | | | | |
|---|---|---|---|---|---|---|
| | | Reach 2 | Reach 3 | Reach 4 | Reach 5 | Reach 6 |
| 10/9/92 | GS05 | 5 | | | | |
| 10/26/92 | GS05 | 21 | | | | |
| | GS07 | | | | 10 | |
| 11/4/92 | SW107 | 2 | | | | |
| | SW506 | 2 | | | | |
| | SW040 | | 2 | | | |
| | SW033 | | 2 | | | |
| | SW034 | | 5 | | | |
| | SW501 | | | 2 | | |
| | SW029 | | | | 5 5 | |
| | SW026 | | | | | 2 |
| 3/24/93 | SW107 | 2 | | | | |
| | SW127 | 2 | | | | |
| | SW040 | | 2 | | | |
| | SW041 | | 2 | | | |
| | SW506 | | 2 | | | |
| | SW033 | | 2 | | | |
| | SW034 | | 2 | | | |
| | SW501 | | | 2 | | |
| | SW029 | | | | 17 | |
| | SW026 | | | | | 2 |
| 4/13/93 | GS07 | | | | 15 | |
| | GS01 | | | | | 2 |
| | GS02 | | | | | 44 |
| 4/24/93 | GS05 | 4 | | | | |
| | GS16 | | 281 | | | |
| | GS17 | | | 33 | | |
| 5/7/93 | GS05 | 4 | | | | |
| 5/15/93 | GS05 | 4 | | | | |

Table 5 18 (Continued)

| Date | Sample Location | Concentration (mg/L) | | | | |
|---|---|---|---|---|---|---|
| | | Reach 2 | Reach 3 | Reach 4 | Reach 5 | Reach 6 |
| 5/17/93 | GS05 | 4 | | | | |
| | GS06 | 628 | | | | |
| | GS18 | | 19 | | | |
| | GS16 | | 325 | | | |
| | GS18 | | 19 | | | |
| 6/12/93 | GS16 | | 31 | | | |
| 6/17/93 | GS16 | | 713 | | | |
| | GS18 | | 49 | | | |
| | GS17 | | | 1326 | | |
| | GS02 | | | | | 10 |
| 6/18/93 | GS06 | 378 | | | | |
| | GS17 | | | 32 | | |
| | GS14 | | | | | 7 |
| 9/2/93 | GS05 | 4 | | | | |
| 9/7/93 | GS05 | 4 | | | | |
| | GS05 | 228 | | | | |
| | GS16 | | 5 | | | |
| | GS17 | | | 4 | | |
| 9/9/93 | GS06 | 8 | | | | |
| | GS16 | | 85 | | | |
| 9/13/93 | GS16 | | 13 | | | |
| 9/18/93 | GS05 | 48 | | | | |

**Table 5-19**
**OU5 HSPF10 Model Water Quality Partition Coefficients and Other Values [1)]**

| COC | Partitian Coefficients (ml/g) pH range 5 9 | | | | |
|---|---|---|---|---|---|
| | Sand (<10% clay)[2)] | Silt (10-30% clay)[2)] | Clay (>30% clay)[2)] | 1/2 life T (yr) | 1st Order Decay Coeff 693/T |
| Barium | 530 0 | 2800 0 | 16000 0 | | |
| Copper | 41 9 | 92 2 | 336 | | |
| Lithium | 0 0 | 0 2 | 0 8 | | |
| Mercury | 322 0 | 580 0 | 5280 0 | | |
| Strontiu | 24 3 | 100 0 | 124 0 | | |
| Zinc | 12 7 | 939 0 | 1460 0 | | |
| $Am_{241}$ | 82 0 | 200 0 | 1000 0 | 458 | $1\ 5x10^{-3}$ |
| $Pu_{239/240}$ | 10 0 | 100 0 | 250 0 | $2\ 41x10^{4}/6\ 57x10^{3}$ | $2\ 9x10^{-5}/1\ 1x10^{-4}$ |
| $U_{233/234}$ | 0 0 | 50 0 | 500 0 | $1\ 59x10^{5}/2\ 45x10^{5}$ | $4\ 0x10^{-6}/2\ 8x10^{-6}$ |
| $U_{235}$ | 0 0 | 50 0 | 500 0 | $7\ 0x10^{8}$ | $9\ 8x10^{10}$ |
| $U_{238}$ | 0 0 | 50 0 | 500 0 | $4\ 47x10^{9}$ | $1\ 55x10^{10}$ |

1) Source D L Strenge and S R Peterson 1989
2) Estimated values based on values given for soil composition with the given total weight percent of clay organic matter and iron and aluminum oxyhydroxides

**TABLE 5-20**
**Woman Creek Water-Budget Calibration Results** [1)]

| Location | Mass Volume (cubic feet) | | Percent Difference |
|---|---|---|---|
| | Observed | Simulated | |
| GS05 (Basin 2) | 1 123 800 | 840 900 | -0 25 |
| GS17 (Basin 4) | 1 892 500 | 2 068 200 | 0 09 |
| GS07 (Basin 5) | 2 013 000 | 2 005 400 | -0 00 |
| GS02 (Basin 6) | 1 809 500 | 2 199 000 | 0 22 |
| Mean Results | 1 709 700 00 | 1 778 375 00 | 0 04 |

1) Calibration period April 1993 through September 1993

## Table 5 21
## Comparison of Observed and Simulated Calibration Results
## for Pond C 1 Water Column Quality[1]

| | Constituents (COCs) | Observed COC Concentrations | 7 Year simulation results | | | 7 Year Results as % of Observed | | |
|---|---|---|---|---|---|---|---|---|
| | | | Median | Mean | Maximum | Median | Mean | Maximum |
| Group 1 (mg/L) | Reach 5 | | | | | | | |
| | Barium | 0 0900 | 0 0110 | 0 0344 | 0 7880 | 12 22% | 38 22% | 875 56% |
| | Lithium | 0 0060 | 0 0008 | 0 0026 | 0 0650 | 13 17% | 43 33% | 1083 33% |
| | Strontium | 0 2750 | 0 0000 | 0 0161 | 0 5480 | 0 01% | 5 85% | 199 27% |
| Group 2 (mg/L) | Reach 5 | | | | | | | |
| | Copper | 0 0030 | 0 0003 | 0 0010 | 0 0588 | 9 63% | 34 11% | 1961 06% |
| | Mercury | 0 0000 | 0 0000 | 0 0000 | 0 0003 | NA | NA | NA |
| | Zinc | 0 0070 | 0 0010 | 0 0034 | 0 1562 | 14 40% | 49 13% | 2231 59 / |
| Group 3 (pCi/L) | Reach 5 | | | | | | | |
| | Americium 241 | 0 0040 | 0 0009 | 0 0012 | 0 0056 | 22 43% | 30 31% | 140 45% |
| | Plutonium 239/240 | 0 0010 | 0 0000 | 0 0000 | 0 0043 | 0 10% | 0 94% | 434 58% |
| Group 4 (pCi/L) | Reach 5 | | | | | | | |
| | Uranium 233/234 | 0 9000 | 0 0239 | 0 0288 | 0 2940 | 2 66% | 3 20% | 32 67% |
| | Uranium 235 | NA | 0 0000 | 0 0000 | 0 0160 | NA | NA | NA |
| | Uranium 238 | 0 6000 | 0 0002 | 0 0019 | 0 8750 | 0 03% | 0 32% | 145 83% |
| | | | | | **Mean** | **8.29%** | **22.82%** | **789.37%** |

1) Simulation period is 1986 through 1992 (7 years)
2) Observed COC concentrations are composite values from OU5 field sampling data.
3) Simulation source terms were calculated with the SID in place

# Table 5 22

## Comparison of Observed and Simulated Calibration Results for Pond C 1 and Woman Creek Bottom Sediment Quality [1]

| | Constituents (COCs) | Observed COC Concentrations | 7 Year Simulation Results | 30-Year Extrapolated Results | SID Inclusion Ratio | 30 Year Simulated Result | 7 Year w/ SID results as % of Observed | 30-Year w/ SID results as % of Observed |
|---|---|---|---|---|---|---|---|---|
| Group 1 (mg/Kg) | Reach 5 | | | | | | | |
| | Barium | NA | 9 800 | 41 993 | 1 850 | 77 687 | NA | NA |
| | Lithium | NA | 0 680 | 2 914 | 1 860 | 5 420 | NA | NA |
| | Strontium | NA | 0 017 | 0 073 | 1 800 | 0 131 | NA | NA |
| Group 2 (mg/Kg) | Reach 5 | | | | | | | |
| | Copper | 0 2430 | 0 865 | 3 707 | 2 077 | 7 698 | 355 97% | 3168 09% |
| | Mercury | 1.3310 | NA | NA | NA | NA | NA | NA |
| | Zinc | 0 7590 | 4 160 | 17 826 | 1 800 | 32 086 | 548 09% | 4227 42% |
| | Reach 4 | | | | | | | |
| | Copper | 14.5000 | 0 955 | 4 092 | 2 077 | 8 499 | 6 59% | 58 62% |
| | Mercury | 0 1000 | NA | NA | NA | NA | NA | NA |
| | Zinc | 44 2000 | 4 470 | 19 154 | 1 800 | 34 477 | 10 11% | 78 00% |
| | Reach 3 | | | | | | | |
| | Copper | 9.3900 | 1 256 | 5 382 | 2 077 | 11 178 | 13 38% | 119 05% |
| | Mercury | 0 1100 | NA | NA | NA | NA | NA | NA |
| | Zinc | 35 0000 | 5 660 | 24 253 | 1 800 | 43 656 | 16 17% | 124 73% |
| Group 3 (pCi/g) | Reach 5 | | | | | | | |
| | Americium 241 | 0 1030 | 0 0000 | 0 0001 | 1 7650 | 0 0002 | 0 02% | 0 15% |
| | Plutonium-239/240 | 0.6840 | 0 0001 | 0 0003 | 1 9180 | 0 0005 | 0 01% | 0 07% |
| | Reach 4 | | | | | | | |
| | Americium-241 | 0.0080 | 0 0003 | 0 0015 | 1 7650 | 0 0026 | 4 25% | 32.14% |
| | Plutonium-239/240 | 0.0390 | 0.0015 | 0 0064 | 1 9180 | 0 0123 | 3 85% | 31 61% |
| | Reach 3 | | | | | | | |
| | Americium-241 | 0.0061 | 0 0002 | 0 0010 | 1 7650 | 0.0018 | 3 93% | 29 76% |
| | Plutonium-239/240 | 0.0071 | 0 0013 | 0 0056 | 1 9180 | 0 0107 | 18 31% | 150 48% |
| Group 4 (pCi/gm) | Reach 5 | | | | | | | |
| | Uranium-233/234 | 2.0890 | 0 260 | 1 114 | 6 771 | 7 544 | 12 45% | 361 11% |
| | Uranium-235 | 0.0920 | 0.010 | 0 043 | 24 362 | 1 044 | 10 87% | 1134 69% |
| | Uranium-238 | 1 7620 | 0 380 | 1 628 | 23 919 | 38 947 | 21 57% | 2210 40% |
| | | | | | | Mean | 68.37% | 781 75% |

1) Simulation period 1986 through 1992 (7 years)
2) Observed COC concentrations are composite values from OU5 field sampling data.
3) Simulation results were calculated with the SID in place
4) [illegible] the [illegible] eased concentration of each COC when the area north of the SID is included

# Table 5 23A
# Statistical Summary of Group 1, 30 Year Simulation
# Water Column Quality

**Reach 3**

| | Barium (mg/L) | | Lithium (mg/L) | | Strontium (mg/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | **0 0001** | **0** | **0 000008** | **0** | **0 0001** | **0** |
| Standard Error | 0 000004 | 0 | 0 000000 | 0 | 0 000007 | 0 |
| Median | 0 0001 | 0 | 0 000009 | 0 | 0 0001 | 0 |
| Mode | n/a | 0 | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 0000 | 0 | 0 000002 | 0 | 0 00004 | 0 |
| Sample Variance | 0 000000 | 0 | 0 000000 | 0 | 0 000000 | 0 |
| Kurtosis | 0 687 | n/a | 0 686 | n/a | 0 591 | n/a |
| Skewness | -0 565 | n/a | -0 564 | n/a | 0 366 | n/a |
| Range | 0 0001 | 0 | 0 000005 | 0 | 0 0002 | 0 |
| Minimum | 0 0001 | 0 | 0 000005 | 0 | 0 00006 | 0 |
| Maximum | 0 0002 | 0 | 0 00001 | 0 | 0 0002 | 0 |
| Sum | 0 003 | 0 | 0 0002 | 0 | 0 004 | 0 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 000008 | n/a | 0 000001 | n/a | 0 00001 | n/a |

**Reach 4**

| | Barium (mg/L) | | Lithium (mg/L) | | Strontium (mg/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | [illegible] | **0** | **0.000002** | **0** | [illegible] | **0** |
| Standard Error | 0 000001 | 0 | 0 000000 | 0 | 0 000003 | 0 |
| Median | 0 00003 | 0 | 0 000002 | 0 | 0 00005 | 0 |
| Mode | n/a | 0 | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 000006 | 0 | 0 000000 | 0 | 0 00001 | 0 |
| Sample Variance | 0 000000 | 0 | 0 000000 | 0 | 0 000000 | 0 |
| Kurtosis | 0 244 | n/a | 0 236 | n/a | 1 38 | n/a |
| Skewness | -0 065 | n/a | 0 059 | n/a | 0 848 | n/a |
| Range | 0 00002 | 0 | 0 000002 | 0 | 0 00007 | 0 |
| Minimum | 0 00002 | 0 | 0 000001 | 0 | 0 00002 | 0 |
| Maximum | 0 00004 | 0 | 0 000003 | 0 | 0 00009 | 0 |
| Sum | 0 001 | 0 | 0 00006 | 0 | 0 001 | 0 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 000002 | n/a | 0 000000 | n/a | 0 000005 | n/a |

## Table 5 23A (Continued)

**Reach 5**

| | **Barium (mg/L)** | | **Lithium (mg/L)** | | **Strontium (mg/L)** | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | **0.234** | **0.118** | **0.031** | **0.010** | **0.082** | **0.020** |
| Standard Error | 0 009 | 0 007 | 0 002 | 0 001 | 0 005 | 0 002 |
| Median | 0 226 | 0 113 | 0 029 | 0 009 | 0 079 | 0 018 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 050 | 0 036 | 0 010 | 0 003 | 0 024 | 0 012 |
| Sample Variance | 0 002 | 0 001 | 0 0001 | 0 00001 | 0 001 | 0 0001 |
| Kurtosis | 2 01 | 3 07 | 1 29 | 3 35 | 0 123 | 3 05 |
| Skewness | 1 26 | 1 49 | 1 26 | 1 65 | 0 561 | 1 42 |
| Range | 0 220 | 0 170 | 0 042 | 0 016 | 0 104 | 0 057 |
| Minimum | 0 162 | 0 063 | 0 018 | 0 005 | 0 044 | 0 003 |
| Maximum | 0 383 | 0 233 | 0 059 | 0 021 | 0 148 | 0 060 |
| Sum | 6 79 | 3 43 | 0 892 | 0 278 | 2 39 | 0 577 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 018 | 0 013 | 0 004 | 0 001 | 0 009 | 0 004 |

**Reach 6**

| | **Barium (mg/L)** | | **Lithium (mg/L)** | | **Strontium (mg/L)** | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | **0.719** | **0.009** | **0.119** | [illegible] | [illegible] | **0.002** |
| Standard Error | 0 164 | 0 001 | 0 027 | 0 0001 | 0 056 | 0 0002 |
| Median | 0 498 | 0 008 | 0 085 | 0 001 | 0 056 | 0 001 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 884 | 0 003 | 0 145 | 0 0003 | 0 302 | 0 001 |
| Sample Variance | 0 782 | 0 00001 | 0 021 | 0 00000 | 0 091 | 0 00000 |
| Kurtosis | 17 8 | 3 14 | 11 7 | 3 53 | 25 6 | 3 84 |
| Skewness | 3 92 | 1 59 | 3 19 | 1 73 | 4 94 | 1 56 |
| Range | 4 74 | 0 014 | 0 719 | 0 001 | 1 66 | 0 005 |
| Minimum | 0 103 | 0 005 | 0 013 | 0 0003 | 0 013 | 0 0002 |
| Maximum | 4 84 | 0 018 | 0 732 | 0 002 | 1 67 | 0 005 |
| Sum | 20 9 | 0 264 | 3 45 | 0 021 | 4 14 | 0 048 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 322 | 0 001 | 0 053 | 0 0001 | 0 110 | 0 0004 |

**Table 5 23B**
**Statistical Summary of Group 1, 30-Year Simulation**
**Sediment Associated Quality**

**Reach 3**

| | Barium (mg/KG) | | Lithium (mg/KG) | | Strontium (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | **17.3** | **17 6** | **1.22** | **1.25** | **1.27** | **1.06** |
| Standard Error | 0 125 | 0 113 | 0 009 | 0 008 | 0 051 | 0 048 |
| Median | 17 4 | 17 7 | 1 2 | 1 3 | 1 2 | 1 1 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 674 | 0 610 | 0 048 | 0 043 | 0 275 | 0 261 |
| Sample Variance | 0 455 | 0 372 | 0 002 | 0 002 | 0 076 | 0 068 |
| Kurtosis | 1 0 | 0 719 | 1 0 | 0 710 | 0 031 | 0 028 |
| Skewness | 0 065 | 0 234 | 0 065 | 0 238 | 0 777 | 0 073 |
| Range | 2 4 | 2 2 | 0 167 | 0 157 | 0 997 | 1 1 |
| Minimum | 16 2 | 16 6 | 1 1 | 1 2 | 0 883 | 0 500 |
| Maximum | 18 5 | 18 8 | 1 3 | 1 3 | 1 9 | 1 6 |
| Sum | 501 | 511 | 35 4 | 36 1 | 36 9 | 30 8 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 245 | 0 222 | 0 017 | 0 016 | 0 100 | 0 095 |

**Reach 4**

| | Barium (mg/KG) | | Lithium (mg/KG) | | Strontium (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | [illegible] | [illegible] | **0.999** | **1.02** | **1.50** | **1 40** |
| Standard Error | 0 118 | 0 100 | 0 008 | 0 007 | 0 042 | 0 045 |
| Median | 14 2 | 14 4 | 1 00 | 1 02 | 1 47 | 1 40 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 637 | 0 537 | 0 045 | 0 038 | 0 224 | 0 242 |
| Sample Variance | 0 405 | 0 289 | 0 002 | 0 001 | 0 050 | 0 058 |
| Kurtosis | -0 144 | -0 672 | 0 156 | -0 678 | -0 039 | 0 049 |
| Skewness | -0 081 | -0 148 | 0 081 | -0 138 | 0 602 | -0 072 |
| Range | 2 64 | 1 95 | 0 187 | 0 137 | 0 865 | 1 02 |
| Minimum | 12 6 | 13 4 | 0 894 | 0 948 | 1 14 | 0 884 |
| Maximum | 15 3 | 15 3 | 1 08 | 1 09 | 2 01 | 1 90 |
| Sum | 410 | 419 | 29 0 | 29 6 | 43 6 | 40 7 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 232 | 0 196 | 0 016 | 0 014 | 0 081 | 0 088 |

# Table 5 23B (Continued)

**Reach 5**

| | Barium (mg/KG) | | Lithium (mg/KG) | | Strontium (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | 15 4 | 15 7 | 0 699 | [redacted] | [redacted] | 0.026 |
| Standard Error | 0 281 | 0 343 | 0 009 | 0 012 | 0 005 | 0 003 |
| Median | 15 0 | 15 1 | 0 699 | 0 678 | 0 085 | 0 023 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 1 51 | 1 85 | 0 046 | 0 063 | 0 026 | 0 016 |
| Sample Variance | 2 29 | 3 42 | 0 002 | 0 004 | 0 001 | 0 000 |
| Kurtosis | 2 62 | 3 68 | 1 05 | 0 065 | 0 336 | 3 41 |
| Skewness | 1 40 | 1 72 | 0 031 | 0 016 | 0 588 | 1 48 |
| Range | 7 07 | 8 80 | 0 170 | 0 270 | 0 114 | 0 079 |
| Minimum | 13 2 | 13 2 | 0 612 | 0 541 | 0 049 | 0 003 |
| Maximum | 20 3 | 22 0 | 0 783 | 0 811 | 0 163 | 0 082 |
| Sum | 448 | 456 | 20 3 | 19 8 | 2 64 | 0 756 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 550 | 0 673 | 0 017 | 0 023 | 0 010 | 0 006 |

**Reach 6**

| | Barium (mg/KG) | | Lithium (mg/KG) | | Strontium (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | [redacted] | [redacted] | 0.693 | [redacted] | [redacted] | 0.426 |
| Standard Error | 0 075 | 0 065 | 0 005 | 0 005 | 0 022 | 0 016 |
| Median | 9 90 | 9 97 | 0 699 | 0 704 | 0 510 | 0 419 |
| Mode | n/a | 10 0 | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 402 | 0 348 | 0 029 | 0 025 | 0 118 | 0 087 |
| Sample Variance | 0 162 | 0 121 | 0 001 | 0 001 | 0 014 | 0 008 |
| Kurtosis | 0 078 | -0 045 | 0 024 | 0 007 | -0 977 | 0 859 |
| Skewness | -0 799 | -0 410 | -0 825 | -0 431 | 0 450 | 0 862 |
| Range | 1 40 | 1 42 | 0 103 | 0 102 | 0 394 | 0 351 |
| Minimum | 8 93 | 9 07 | 0 627 | 0 639 | 0 378 | 0 295 |
| Maximum | 10 3 | 10 5 | 0 730 | 0 742 | 0 771 | 0 646 |
| Sum | 285 | 287 | 20 1 | 20 2 | 15 9 | 12 4 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 146 | 0 127 | 0 011 | 0 009 | 0 043 | 0 032 |

**Table 5 24A**
**Statistical Summarv of Group 2 30 Year Simulation**
**Water Column Quality**

**Reach 3**

| | Copper (ug/L) | | Mercury (ug/L) | | Zinc (ug/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | **0 088** | **0** | **0 000000** | **0** | **0.00005** | **0** |
| Standard Error | 0 004 | 0 | 0 000000 | 0 | 0 00000 | 0 |
| Median | 0 088 | 0 | 0 000000 | 0 | 0 00005 | 0 |
| Mode | n/a | 0 | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 022 | 0 | 0 000000 | 0 | 0 000009 | 0 |
| Sample Variance | 0 0005 | 0 | 0 000000 | 0 | 0 000000 | 0 |
| Kurtosis | 0 274 | n/a | 0 701 | n/a | -0 675 | n/a |
| Skewness | 0 685 | n/a | -0 577 | n/a | -0 574 | n/a |
| Range | 0 075 | 0 | 0 000000 | 0 | 0 00003 | 0 |
| Minimum | 0 056 | 0 | 0 000000 | 0 | 0 00003 | 0 |
| Maximum | 0 131 | 0 | 0 000000 | 0 | 0 00006 | 0 |
| Sum | 2 54 | 0 | 0 000002 | 0 | 0 001 | 0 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 008 | n/a | 0 000000 | n/a | 0 000003 | n/a |

**Reach 4**

| | Copper (ug/L) | | Mercury (ug/L) | | Zinc (ug/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | **[illegible]** | **0** | **0.000000** | **0** | **[illegible]** | **0** |
| Standard Error | 0 001 | 0 | 0 000000 | 0 | 0 000000 | 0 |
| Median | 0 027 | 0 | 0 000000 | 0 | 0 00001 | 0 |
| Mode | n/a | 0 | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 007 | 0 | 0 000000 | 0 | 0 000002 | 0 |
| Sample Variance | 0 00005 | 0 | 0 000000 | 0 | 0 000000 | 0 |
| Kurtosis | -0 481 | n/a | 0 106 | n/a | 0 024 | n/a |
| Skewness | 0 626 | n/a | 0 077 | n/a | -0 014 | n/a |
| Range | 0 024 | 0 | 0 000000 | 0 | 0 000009 | 0 |
| Minimum | 0 017 | 0 | 0 000000 | 0 | 0 000006 | 0 |
| Maximum | 0 041 | 0 | 0 000000 | 0 | 0 00002 | 0 |
| Sum | 0 801 | 0 | 0 000000 | 0 | 0 000303 | 0 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 003 | n/a | 0 000000 | n/a | 0 000001 | n/a |

# Table 5 24A (Contnued)

**Reach 5**

| | Copper (ug/L) | | Mercury (ug/L) | | Zinc (ug/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *medıan* | *mean* | *medıan* | *mean* | *medıan* |
| Mean | 25.1 | 9 17 | 0.00006 | [illegible] | [illegible] | 0.016 |
| Standard Error | 1 75 | 0 651 | 0 00000 | 0 00000 | 0 003 | 0 001 |
| Medıan | 25 3 | 9 18 | 0 00005 | 0 00002 | 0 044 | 0 015 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Devıatıon | 9 40 | 3 51 | 0 00002 | 0 00001 | 0 017 | 0 006 |
| Sample Varıance | 88 3 | 12 3 | 0 00000 | 0 00000 | 0 0003 | 0 00004 |
| Kurtosıs | 0 387 | 0 428 | 2 67 | 4 94 | 2 52 | 4 74 |
| Skewness | 0 404 | 0 275 | 1 53 | 1 96 | 1 50 | 1 92 |
| Range | 40 2 | 15 5 | 0 00009 | 0 00004 | 0 075 | 0 031 |
| Mınımum | 8 83 | 2 60 | 0 00003 | 0 00001 | 0 027 | 0 007 |
| Maxımum | 49 0 | 18 1 | 0 00012 | 0 00005 | 0 102 | 0 038 |
| Sum | 728 | 266 | 0 002 | 0 001 | 1 40 | 0 451 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 3 42 | 1 28 | 0 00001 | 0 00000 | 0 006 | 0 002 |

**Reach 6**

| | Copper (ug/L) | | Mercury (ug/L) | | Zinc (ug/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *medıan* | *mean* | *medıan* | *mean* | *medıan* |
| Mean | [illegible] | 0.688 | 0.000 | [illegible] | [illegible] | 0.001 |
| Standard Error | 15 3 | 0 049 | 0 000 | 0 000 | 0 037 | 0 000 |
| Medıan | 65 4 | 0 696 | 0 000 | 0 000 | 0 134 | 0 001 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Devıatıon | 82 6 | 0 266 | 0 0002 | 0 0000 | 0 198 | 0 001 |
| Sample Varıance | 6 823 | 0 071 | 0 0000 | 0 0000 | 0 039 | 0 000 |
| Kurtosıs | 12 5 | 0 333 | 11 0 | 4 79 | 10 8 | 4 54 |
| Skewness | 3 14 | 0 296 | 3 08 | 1 95 | 3 06 | 1 90 |
| Range | 428 | 1 15 | 0 001 | 0 000 | 0 980 | 0 002 |
| Mınımum | 11 3 | 0 203 | 0 00002 | 0 00000 | 0 018 | 0 001 |
| Maxımum | 439 | 1 35 | 0 001 | 0 000 | 0 998 | 0 003 |
| Sum | 2 394 | 20 0 | 0 006 | 0 000 | 5 03 | 0 035 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 30 1 | 0 097 | 0 0001 | 0 00000 | 0 072 | 0 0002 |

## Table 5 24B
## Statistical Summary of Group 2, 30-Year Simulation
## Sediment Associated Quality

**Reach 3**

| | Coppper (mg/KG) | | Mercury (mg/KG) | | Zinc (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | **101 010** | **91 483** | **0 004** | **0.004** | **3.48** | **3.88** |
| Standard Error | 1 549 | 1 667 | 0 000 | 0 000 | 0 087 | 0 097 |
| Median | 101 574 | 92 800 | 0 004 | 0 005 | 3 40 | 3 96 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 8 339 | 8 977 | 0 001 | 0 001 | 0 469 | 0 522 |
| Sample Variance | 69 546 829 | 80 592 166 | 0 000 | 0 000 | 0 220 | 0 272 |
| Kurtosis | 0 30 | 1 23 | 0 357 | 1 12 | -0 146 | 1 17 |
| Skewness | 0 19 | 0 20 | 0 023 | -0 036 | -0 065 | -0 151 |
| Range | 33 123 | 28 216 | 0 002 | 0 002 | 1 90 | 1 85 |
| Minimum | 84 959 | 76 084 | 0 003 | 0 003 | 2 43 | 3 01 |
| Maximum | 118 083 | 104 300 | 0 005 | 0 006 | 4 33 | 4 86 |
| Sum | 2 929 281 | 2 652 994 | 0 115 | 0 130 | 99 4 | 112 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 3 035 | 3 267 | 0 0002 | 0 0002 | 0 171 | 0 190 |

**Reach 4**

| | Coppper (mg/KG) | | Mercury (mg/KG) | | Zinc (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| **Mean** | [illegible] | **13 915** | **0.004** | [illegible] | [illegible] | **3 67** |
| Standard Error | 326 | 236 | 0 0001 | 0 0001 | 0 051 | 0 059 |
| Median | 15 918 | 13 547 | 0 004 | 0 004 | 3 41 | 3 63 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 1 754 | 1 271 | 0 0004 | 0 0005 | 0 275 | 0 319 |
| Sample Variance | 3 075 998 | 1 614 545 | 0 0000 | 0 0000 | 0 075 | 0 102 |
| Kurtosis | -0 963 | 1 77 | 0 236 | 1 130 | -0 410 | 1 13 |
| Skewness | 0 271 | 1 12 | 0 183 | -0 509 | 0 249 | -0 552 |
| Range | 6 576 | 5 828 | 0 002 | 0 002 | 1 04 | 1 53 |
| Minimum | 13 082 | 12,039 | 0 003 | 0 003 | 2 85 | 2 75 |
| Maximum | 19 658 | 17 867 | 0 005 | 0 005 | 3 89 | 4 27 |
| Sum | 470 593 | 403 546 | 0 112 | 0 121 | 98 4 | 106 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 638 | 462 | 0 0001 | 0 0002 | 0 100 | 0 116 |

## Table 5 24B (Continued)

**Reach 5**

| | Coppper (mg/KG) | | Mercury (mg/KG) | | Zinc (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| Mean | 1 001 | 992 | 0.003 | 0.004 | [illegible] | 3 19 |
| Standard Error | 66 0 | 68 6 | 0 000 | 0 000 | 0 056 | 0 059 |
| Median | 986 | 968 | 0 003 | 0 004 | 2 77 | 3 16 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 355 | 370 | 0 000 | 0 001 | 0 301 | 0 316 |
| Sample Variance | 126 159 | 136 546 | 0 000 | 0 000 | 0 091 | 0 100 |
| Kurtosis | 0 591 | 0 115 | 0 655 | -0 928 | 0 580 | -0 663 |
| Skewness | 0 260 | 0 720 | 0 683 | 0 264 | 0 638 | 0 328 |
| Range | 1 307 | 1 315 | 0 002 | 0 002 | 1 32 | 1 19 |
| Minimum | 381 | 507 | 0 003 | 0 003 | 2 34 | 2 58 |
| Maximum | 1 688 | 1 822 | 0 005 | 0 005 | 3 66 | 3 77 |
| Sum | 29 039 | 28 760 | 0 101 | 0 113 | 82 3 | 92 4 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 129 | 134 | 0 0002 | 0 0002 | 0 110 | 0 115 |

**Reach 6**

| | Coppper (mg/KG) | | Mercury (mg/KG) | | Zinc (mg/KG) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| Mean | [illegible] | 8,338 | 0.002 | [illegible] | [illegible] | 2.02 |
| Standard Error | 283 | 287 | 0 0000 | 0 0001 | 0 033 | 0 032 |
| Median | 11 627 | 8 115 | 0 002 | 0 002 | 1 85 | 2 00 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 1 524 | 1 546 | 0 0003 | 0 0003 | 0 176 | 0 170 |
| Sample Variance | 2 322,356 | 2 391 057 | 0 0000 | 0 0000 | 0 031 | 0 029 |
| Kurtosis | -0 411 | 20 4 | -0 826 | -0 821 | -0 550 | -0 686 |
| Skewness | -0 335 | 4 19 | 0 178 | 0 143 | 0 123 | 0 168 |
| Range | 5 901 | 8 800 | 0 001 | 0 001 | 0 698 | 0 660 |
| Minimum | 7 933 | 6 973 | 0 001 | 0 001 | 1 51 | 1 69 |
| Maximum | 13 834 | 15 773 | 0 002 | 0 002 | 2 21 | 2 35 |
| Sum | 326 025 | 241 801 | 0 051 | 0 055 | 52 7 | 58 5 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 555 | 563 | 0 0001 | 0 0001 | 0 064 | 0 062 |

**Table 5 25A**
**Statistical Summary of Group 3, 30 Year Simulation**
**Water Column Quality**

**Reach 3**

| | Am241 (pCi/L) | | Pu239/240 (pCi/L) | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| **Mean** | **0 0002** | **0** | **0.00004** | **0** |
| Standard Error | 0 0000 | 0 | 0 00000 | 0 |
| Median | 0 0002 | 0 | 0 00004 | 0 |
| Mode | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 00005 | 0 | 0 00001 | 0 |
| Sample Variance | 0 00000 | 0 | 0 00000 | 0 |
| Kurtosis | 0 308 | n/a | -0 658 | n/a |
| Skewness | 0 684 | n/a | 0 573 | n/a |
| Range | 0 0002 | 0 | 0 00002 | 0 |
| Minimum | 0 0001 | 0 | 0 00002 | 0 |
| Maximum | 0 0003 | 0 | 0 00005 | 0 |
| Sum | 0 006 | 0 | 0 001 | 0 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 00002 | n/a | 0 00000 | n/a |

**Reach 4**

| | Am241 (pCi/L) | | Pu239/240 (pCi/L) | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| **Mean** | **0.00004** | **0** | [illegible] | **0** |
| Standard Error | 0 00000 | 0 | 0 000000 | 0 |
| Median | 0 00004 | 0 | 0 000009 | 0 |
| Mode | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 00001 | 0 | 0 000002 | 0 |
| Sample Variance | 0 00000 | 0 | 0 000000 | 0 |
| Kurtosis | 0 353 | n/a | -0 217 | n/a |
| Skewness | 0 633 | n/a | -0 156 | n/a |
| Range | 0 00004 | 0 | 0 000008 | 0 |
| Minimum | 0 00003 | 0 | 0 000005 | 0 |
| Maximum | 0 00007 | 0 | 0 00001 | 0 |
| Sum | 0 001 | 0 | 0 0003 | 0 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 000004 | n/a | 0 000001 | n/a |

## Table 5 25A (Contnued)

**Reach 5**

| | **Am241 (pCi/L)** | | **Pu239/240 (pCi/L)** | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| Mean | 0 134 | 0.047 | [illegible] | [illegible] |
| Standard Error | 0 002 | 0 001 | 0 000 | 0 000 |
| Median | 0 134 | 0 046 | 0 005 | 0 002 |
| Mode | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 010 | 0 003 | 0 002 | 0 001 |
| Sample Variance | 0 000 | 0 000 | 0 000 | 0 000 |
| Kurtosis | 0 190 | -0 121 | 3 31 | 8 79 |
| Skewness | 0 087 | 0 074 | 1 70 | 2 70 |
| Range | 0 042 | 0 013 | 0 009 | 0 004 |
| Minimum | 0 113 | 0 040 | 0 003 | 0 001 |
| Maximum | 0 155 | 0 053 | 0 012 | 0 005 |
| Sum | 3 88 | 1 35 | 0 159 | 0 050 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 004 | 0 001 | 0 001 | 0 000 |

**Reach 6**

| | **Am241 (pCi/L)** | | **Pu239/240 (pCi/L)** | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| Mean | 0.319 | 0.004 | [illegible] | [illegible] |
| Standard Error | 0 119 | 0 000 | 0 004 | 0 000 |
| Median | 0 360 | 0 004 | 0 015 | 0 000 |
| Mode | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 640 | 0 000 | 0 022 | 0 000 |
| Sample Variance | 0 409 | 0 0000 | 0 0005 | 0 0000 |
| Kurtosis | 18 7 | 0 145 | 10 2 | 8 87 |
| Skewness | 4 05 | 0 110 | 2 97 | 2 73 |
| Range | 3 47 | 0 001 | 0 106 | 0 000 |
| Minimum | 0 068 | 0 003 | 0 002 | 0 000 |
| Maximum | 3 54 | 0 004 | 0 108 | 0 000 |
| Sum | 15 0 | 0 104 | 0 568 | 0 004 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 233 | 0 000 | 0 008 | 0 000 |

**Table 5 25B**

**Statistical Summary of Group 3 30 Year Simulation**

**Sediment Associated Quality**

**Reach 3**

| | Am241 (pCi/g) | | Pu239/240 (pCi/g) | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| **Mean** | **0 184** | **0 167** | **0.003** | **0.003** |
| Standard Error | 0 003 | 0 003 | 0 000 | 0 000 |
| Median | 0 185 | 0 169 | 0 003 | 0 003 |
| Mode | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 015 | 0 016 | 0 000 | 0 000 |
| Sample Variance | 0 000 | 0 000 | 0 000 | 0 000 |
| Kurtosis | -0 299 | 1 226 | -0 041 | 1 24 |
| Skewness | -0 201 | -0 200 | 0 131 | 0 |
| Range | 0 060 | 0 051 | 0 002 | 0 001 |
| Minimum | 0 155 | 0 139 | 0 002 | 0 003 |
| Maximum | 0 215 | 0 190 | 0 004 | 0 004 |
| Sum | 5 34 | 4 85 | 0 083 | 0 094 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 005 | 0 006 | 0 000 | 0 000 |

**Reach 4**

| | Am241 (pCi/g) | | Pu239/240 (pCi/g) | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| **Mean** | **0 012** | **0 010** | **0.003** | [illegible] |
| Standard Error | 0 000 | 0 000 | 0 000 | 0 000 |
| Median | 0 012 | 0 010 | 0 003 | 0 004 |
| Mode | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 002 | 0 002 | 0 000 | 0 000 |
| Sample Variance | 0 000 | 0 000 | 0 000 | 0 000 |
| Kurtosis | 7 15 | 5 92 | 0 278 | 0 015 |
| Skewness | 2 02 | 1 97 | -0 665 | -0 392 |
| Range | 0 012 | 0 008 | 0 001 | 0 001 |
| Minimum | 0 009 | 0 009 | 0 003 | 0 003 |
| Maximum | 0 021 | 0 017 | 0 004 | 0 004 |
| Sum | 0 361 | 0 304 | 0 100 | 0 108 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 001 | 0 001 | 0 000 | 0 000 |

## Table 5 25B (Continued)

**Reach 5**

| | Am241 (pCi/g) | | Pu239/240 (pCi/g) | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| **Mean** | **0 150** | **0 132** | [illegible] | [illegible] |
| Standard Error | 0 003 | 0 003 | 0 000 | 0 000 |
| Median | 0 151 | 0 134 | 0 003 | 0 003 |
| Mode | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 015 | 0 014 | 0 0003 | 0 0003 |
| Sample Variance | 0 0002 | 0 0002 | 0 0000 | 0 0000 |
| Kurtosis | 0 107 | 0 754 | 0 514 | -0 840 |
| Skewness | 0 549 | 0 169 | 0 673 | 0 083 |
| Range | 0 064 | 0 051 | 0 001 | 0 001 |
| Minimum | 0 111 | 0 105 | 0 002 | 0 003 |
| Maximum | 0 174 | 0 156 | 0 003 | 0 004 |
| Sum | 4 35 | 3 82 | 0 079 | 0 088 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 006 | 0 005 | 0 0001 | 0 0001 |

**Reach 6**

| | Am241 (pCi/g) | | Pu239/240 (pCi/g) | |
|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* |
| **Mean** | **0 135** | **0 100** | [illegible] | [illegible] |
| Standard Error | 0 003 | 0 004 | 0 000 | 0 000 |
| Median | 0 140 | 0 097 | 0 002 | 0 002 |
| Mode | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 018 | 0 020 | 0 000 | 0 000 |
| Sample Variance | 0 000 | 0 000 | 0 000 | 0 000 |
| Kurtosis | 0 413 | 21 526 | 0 447 | 0 534 |
| Skewness | 0 332 | 4 354 | 0 175 | 0 076 |
| Range | 0 071 | 0 111 | 0 001 | 0 001 |
| Minimum | 0 095 | 0 084 | 0 001 | 0 002 |
| Maximum | 0 166 | 0 195 | 0 002 | 0 002 |
| Sum | 3 91 | 2 89 | 0 051 | 0 055 |
| Count | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 007 | 0 007 | 0 000 | 0 000 |

**Table 5 26A**
**Statistical Summary of Group 4, 30-Year Simulation**
**Water Column Quality**

**Reach 3**

| | U233/234 (pCi/L) | | U235 (pCi/L) | | U238 (pCi/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| Mean | 0 010 | 0 | 0 002 | 0 | 0 104 | 0 |
| Standard Error | 0 0003 | 0 | 0 0001 | 0 | 0 004 | 0 |
| Median | 0 010 | 0 | 0 002 | 0 | 0 109 | 0 |
| Mode | n/a | 0 | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 002 | 0 | 0 0004 | 0 | 0 019 | 0 |
| Sample Variance | 0 0000 | 0 | 0 0000 | 0 | 0 0004 | 0 |
| Kurtosis | 0 734 | n/a | 0 734 | n/a | -0 734 | n/a |
| Skewness | -0 555 | n/a | 0 555 | n/a | -0 555 | n/a |
| Range | 0 006 | 0 | 0 001 | 0 | 0 066 | 0 |
| Minimum | 0 006 | 0 | 0 001 | 0 | 0 065 | 0 |
| Maximum | 0 012 | 0 | 0 002 | 0 | 0 132 | 0 |
| Sum | 0 286 | 0 | 0 056 | 0 | 3 02 | 0 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 001 | n/a | 0 0001 | n/a | 0 007 | n/a |

**Reach 4**

| | U233/234 (pCi/L) | | U235 (pCi/L) | | U238 (pCi/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| Mean | 0 002 | 0 | 0 0003 | 0 | 0 019 | 0 |
| Standard Error | 0 000 | 0 | 0 0000 | 0 | 0 001 | 0 |
| Median | 0 002 | 0 | 0 0004 | 0 | 0 019 | 0 |
| Mode | n/a | 0 | n/a | 0 | n/a | 0 |
| Standard Deviation | 0 0004 | 0 | 0 0001 | 0 | 0 004 | 0 |
| Sample Variance | 0 00000 | 0 | 0 00000 | 0 | 0 00002 | 0 |
| Kurtosis | -0 109 | n/a | 0 110 | n/a | 0 110 | n/a |
| Skewness | -0 035 | n/a | 0 036 | n/a | -0 036 | n/a |
| Range | 0 002 | 0 | 0 0003 | 0 | 0 016 | 0 |
| Minimum | 0 001 | 0 | 0 0002 | 0 | 0 012 | 0 |
| Maximum | 0 003 | 0 | 0 0005 | 0 | 0 028 | 0 |
| Sum | 0 052 | 0 | 0 010 | 0 | 0 543 | 0 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 0001 | n/a | 0 00003 | n/a | 0 001 | n/a |

## Table 5 26A (Continued)

**Reach 5**

| | U233/234 (pCi/L) | | U235 (pCi/L) | | U238 (pCi/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| Mean | 3 91 | 1 38 | 0.260 | 0 080 | 13.6 | 4.26 |
| Standard Error | 0 082 | 0 026 | 0 018 | 0 006 | 0 976 | 0 368 |
| Median | 3 82 | 1 35 | 0 250 | 0 076 | 13 0 | 3 95 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 442 | 0 141 | 0 095 | 0 031 | 5 26 | 1 98 |
| Sample Variance | 0 195 | 0 020 | 0 009 | 0 001 | 27 6 | 3 94 |
| Kurtosis | 0 859 | 0 256 | 2 51 | 3 71 | 3 54 | 4 91 |
| Skewness | 1 11 | 0 520 | 1 49 | 1 59 | 1 69 | 1 99 |
| Range | 1 69 | 0 588 | 0 415 | 0 147 | 23 8 | 9 21 |
| Minimum | 3 37 | 1 12 | 0 141 | 0 035 | 7 44 | 2 05 |
| Maximum | 5 06 | 1 71 | 0 555 | 0 182 | 31 2 | 11 3 |
| Sum | 113 | 40 0 | 7 53 | 2 32 | 395 | 124 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 161 | 0 051 | 0 034 | 0 011 | 1 91 | 0 722 |

**Reach 6**

| | U233/234 (pCi/L) | | U235 (pCi/L) | | U238 (pCi/L) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | *mean* | *median* |
| Mean | [illegible] | 0.104 | 0.938 | [illegible] | [illegible] | 0.322 |
| Standard Error | 3 09 | 0 002 | 0 197 | 0 000 | 10 5 | 0 029 |
| Median | 10 2 | 0 103 | 0 707 | 0 006 | 37 9 | 0 293 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 16 7 | 0 011 | 1 06 | 0 002 | 56 8 | 0 155 |
| Sample Variance | 278 | 0 0001 | 1 12 | 0 0000 | 3226 | 0 024 |
| Kurtosis | 16 8 | 1 57 | 9 50 | 3 86 | 11 1 | 5 33 |
| Skewness | 3 76 | 0 723 | 2 91 | 1 68 | 3 10 | 2 14 |
| Range | 89 3 | 0 052 | 5 10 | 0 012 | 281 | 0 734 |
| Minimum | 2 10 | 0 083 | 0 094 | 0 002 | 5 30 | 0 139 |
| Maximum | 91 4 | 0 135 | 5 20 | 0 014 | 287 | 0 873 |
| Sum | 424 | 3 02 | 27 2 | 0 176 | 1430 | 9 33 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 6 06 | 0 004 | 0 386 | 0 001 | 20 7 | 0 056 |

## Table 5 26B
## Statistical Summary of Group 4 30 Year Simulation
## Sediment Associated Quality

**Reach 3**

| | U233/234 (pCI/G) | | U235 (pCI/G) | | U238 (pCI/G) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | | |
| Mean | 1 50 | 1.53 | 0 294 | 0.300 | 15 8 | 16.1 |
| Standard Error | 0 011 | 0 010 | 0 002 | 0 002 | 0 114 | 0 104 |
| Median | 1 51 | 1 54 | 0 296 | 0 302 | 15 9 | 16 2 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 058 | 0 053 | 0 011 | 0 010 | 0 615 | 0 560 |
| Sample Variance | 0 003 | 0 003 | 0 000 | 0 000 | 0 379 | 0 314 |
| Kurtosis | 1 04 | 0 726 | 1 04 | 0 73 | 1 04 | 0 726 |
| Skewness | 0 063 | 0 236 | 0 063 | -0 236 | 0 063 | 0 236 |
| Range | 0 204 | 0 193 | 0 040 | 0 038 | 2 15 | 2 03 |
| Minimum | 1 40 | 1 44 | 0 275 | 0 282 | 14 8 | 15 1 |
| Maximum | 1 61 | 1 63 | 0 315 | 0 320 | 16 9 | 17 2 |
| Sum | 43 4 | 44 3 | 8 53 | 8 70 | 458 | 467 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 021 | 0 019 | 0 004 | 0 004 | 0 224 | 0 204 |

**Reach 4**

| | U233/234 (pCI/G) | | U235 (pCI/G) | | U238 (pCI/G) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | | |
| Mean | 1.22 | 1.26 | 0.240 | 0.247 | 12.9 | 13.3 |
| Standard Error | 0 012 | 0 012 | 0 002 | 0 002 | 0 130 | 0 131 |
| Median | 1 23 | 1 27 | 0 242 | 0 249 | 13 0 | 13 3 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 067 | 0 067 | 0 013 | 0 013 | 0 701 | 0 706 |
| Sample Variance | 0 004 | 0 004 | 0 000 | 0 000 | 0 492 | 0 498 |
| Kurtosis | -0 72 | -0 066 | 0 72 | -0 07 | -0 72 | 0 066 |
| Skewness | -0 033 | 0 054 | 0 033 | 0 054 | -0 033 | 0 054 |
| Range | 0 256 | 0 278 | 0 050 | 0 055 | 2 69 | 2 93 |
| Minimum | 1 10 | 1 13 | 0 215 | 0 222 | 11 6 | 11 9 |
| Maximum | 1 35 | 1 41 | 0 266 | 0 276 | 14 3 | 14 8 |
| Sum | 35 5 | 36 5 | 6 96 | 7 16 | 374 | 385 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 024 | 0 024 | 0 005 | 0 005 | 0 255 | 0 257 |

## Table 5 26B (Contnued)

**Reach 5**

| | U233/234 (pCI/G) | | U235 (pCI/G) | | U238 (pCI/G) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | | |
| **Mean** | **3 65** | **3.35** | **0 128** | **0.143** | **6.86** | **7 70** |
| Standard Error | 0 048 | 0 044 | 0 002 | 0 002 | 0 116 | 0 108 |
| Median | 3 69 | 3 37 | 0 128 | 0 145 | 6 86 | 7 77 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 260 | 0 234 | 0 012 | 0 011 | 0 627 | 0 583 |
| Sample Variance | 0 067 | 0 055 | 0 000 | 0 000 | 0 393 | 0 340 |
| Kurtosis | 0 007 | 0 689 | 0 594 | -0 244 | 0 551 | 0 264 |
| Skewness | -0 548 | -0 196 | 0 492 | -0 254 | 0 482 | 0 268 |
| Range | 1 06 | 0 848 | 0 052 | 0 045 | 2 77 | 2 39 |
| Minimum | 2 99 | 2 90 | 0 108 | 0 120 | 5 80 | 6 42 |
| Maximum | 4 06 | 3 75 | 0 160 | 0 164 | 8 57 | 8 81 |
| Sum | 106 | 97 0 | 3 71 | 4 16 | 199 | 223 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 094 | 0 085 | 0 004 | 0 004 | 0 228 | 0 212 |

**Reach 6**

| | U233/234 (pCI/G) | | U235 (pCI/G) | | U238 (pCI/G) | |
|---|---|---|---|---|---|---|
| | *mean* | *median* | *mean* | *median* | | |
| **Mean** | [illegible] | **0.861** | **0.167** | [illegible] | [illegible] | **9 07** |
| Standard Error | 0 007 | 0 006 | 0 001 | 0 001 | 0 069 | 0 059 |
| Median | 0 866 | 0 869 | 0 169 | 0 170 | 9 05 | 9 11 |
| Mode | n/a | n/a | n/a | n/a | n/a | n/a |
| Standard Deviation | 0 037 | 0 030 | 0 007 | 0 006 | 0 369 | 0 319 |
| Sample Variance | 0 001 | 0 001 | 0 000 | 0 000 | 0 136 | 0 102 |
| Kurtosis | 0 016 | -0 001 | 0 028 | -0 024 | 0 028 | -0 024 |
| Skewness | -0 797 | -0 432 | 0 835 | -0 425 | -0 835 | 0 424 |
| Range | 0 134 | 0 125 | 0 024 | 0 025 | 1 30 | 1 32 |
| Minimum | 0 775 | 0 790 | 0 152 | 0 155 | 8 14 | 8 32 |
| Maximum | 0 91 | 0 915 | 0 176 | 0 180 | 9 44 | 9 64 |
| Sum | 25 0 | 25 0 | 4 85 | 4 90 | 260 | 263 |
| Count | 29 | 29 | 29 | 29 | 29 | 29 |
| Confidence Level (95%) | 0 013 | 0 011 | 0 003 | 0 002 | 0 134 | 0 116 |

## Table 5-27A

## Fugitive Dust Model OU 5 Area Sources for Radionuclides

| | | | | | | | | Radionuclide levels (pCi/g) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source number | x coordinate of center (meters) | y coordinate of center (meters) | x dimension of rectangle (meters) | y dimension of rectangle (meters) | height of emission (meters) | angle of rotation | No of sample s | Am 241 | Pu 239/240 | U 233/234 | U 235 | U 238 |
| 1 | 24 958 40 | 14 569 32 | 142 28 | 97 45 | 0 | 52 76 | 18 | 0 023 | 0 096 | 12 322 | 2 505 | 106 93 8 |
| 2 | 24 967 69 | 14 601 44 | 7 62 | 7 62 | 0 | 0 | 1 | 0 19 (0) | 0 13 (0) | 2 800 | 670 | 38 000 |
| 3 | 24 754 33 | 14 492 30 | 15 24 | 15 24 | 0 | 0 | 1 | 0 084 | 0 009 | 200 | 46 | 2 000 |
| 4 | 24 265 27 | 14 487 14 | 392 88 | 192 02 | 0 | 0 | 17 22 | 0 02 | 0 06 | 7 19 | 0 39 | 27 23 |
| 5 | 24 535 63 | 14 506 80 | 147 84 | 78 94 | 0 | 0 | 17 22 | 0 02 | 0 06 | 7 19 | 0 39 | 27 23 |

Source of sample results DOE 1994a RFEDS

## Table 5-27B

## Fugitive Dust Model OU 5 Area Sources for Organic Chemicals of Concern

| Source number | x coordinate of center (meters) | y-coordinate of center (meters) | x dimension of rectangle (meters) | y dimension of rectangle (meters) | height of emission (meters) | angle of rotation | No of samples | Contaminant levels (ug/g) Arochlor 1254 | Benzo(a) anthracene | Benzo(b) fuor anthene | Benzo(a) pyrene |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24925 23 | 14569 03 | 201 17 | 201 17 | 0 | 0 | 15 36 | 7 13E 01 | 6 75E 01 | 7 57E 01 | 5 20E 01 |
| 2 | 25009 | 14568 | 7 62 | 7 62 | 0 | 0 | 0-1 | 0 | 4 50E01 | 4 90E01 | 4 30E01 |
| 3 | 24917 | 14568 | 7 62 | 7 62 | 0 | 0 | 0-1 | 0 | 0 | 0 | 0 |
| 4 | 24887 | 14507 | 7 62 | 7 62 | 0 | 0 | 0-1 | 0 | 0 | 0 | 0 |
| 5 | 24398 17 | 14482 19 | 402 34 | 100 58 | 0 | 5 36 | 0 9 | 0 | 0 | 6 92E 03 | 8 28E 02 |

Source of sample results DOE 1994a RFEDS

## Table 5-27B (Continued)

| | | | | | | | | Contaminant levels (ug/g) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Source number | x coordinate of center (meters) | y coordinate of center (meters) | x dimension of rectangle (meters) | y dimension of rectangle (meters) | height of emission (meters) | angle of rotation | No of samples | Dibenzo (a h) anthracene | Fluor anthene | Indeno (1 2 3 c d) pyrene | Pyrene |
| 1 | 24 925 23 | 14 569 03 | 201 17 | 201 17 | 0 | 0 | 15 36 | 2 71E 01 | 8 37E 01 | 3 00E 01 | 1 02E00 |
| 2 | 25 009 | 14 568 | 7 62 | 7 62 | 0 | 0 | 0 1 | 7 00E00 | 1 40E02 | 3 2E01 | 1 20E02 |
| 3 | 24 917 | 14 568 | 7 62 | 7 62 | 0 | 0 | 0-1 | 1 10E00 | 1 20E01 | 3 10E00 | 0 |
| 4 | 24 887 | 14 507 | 7 62 | 7 62 | 0 | 0 | 0 1 | 0 | 0 | 0 | 0 |
| 5 | 24 398 17 | 14 482 19 | 402 34 | 100 58 | 0 | 5 36 | 0 9 | 1 11E 02 | 8 10E 02 | 1 161E 02 | 9 40E 02 |

Source of sample results DOE 1994a RFEDS

## Table 5-27C

### Fugitive Dust Model OU 5 Area Sources for Metals Chemicals of Concern

| Source number | x coordinate of center (meters) | y-coordinate of center (meters) | x dimension of rectangle (meters) | y dimension of rectangle (meters) | height of emission (meters) | angle of rotation | No of samples | Contaminant levels (mg/g) Copper | Mercury | Silver |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24925 23 | 14569 03 | 201 17 | 201 17 | 0 | 0 | 20 36 | 3 15E 02 | 1 32E 04 | 1 05E 03 |
| 2 | 25009 | 14568 | 7 62 | 7 62 | 0 | 0 | 0 1 | 0 | 0 | 0 |
| 3 | 24917 | 14568 | 7 62 | 7 62 | 0 | 0 | 0-1 | 0 | 0 | 0 |
| 4 | 24887 | 14507 | 7 62 | 7 62 | 0 | 0 | 0-1 | 0 | 0 | 1 26E 02 |
| 5 | 24398 17 | 14482 19 | 402 34 | 100 58 | 0 | 5 36 | 10 | 1 62E 02 | 7 10E 05 | 1 53E 03 |

Source of sample results DOE 1994a RFEDS

Table 5 28

**Fugitive Dust Model OU 5 Source Input Parameters**
**Particle Size Distributions and Densities**

| Particle size class | Grain size distribution (Percent finer by weight) | Particle size distribution (Fraction within 100 μm range) | Particle density ($g/cm^3$) |
|---|---|---|---|
| ≤10 μm | 19 | 0 500 | 1 385 |
| ≤30 μm | 28 | 0 237 | |
| ≤100 μm | 38 | 0 263 | |

Source DOE 1994a

## Table 5 29

### Fugitive Dust Model OU 5 Source Multipliers and Orders of Magnitude of Output Results

| Radionuclide Constituent | Source multiplier | Order of magnitude of output results ($pCi/m^3$ for concentration $pCi/m^2$ s for deposition) |
|---|---|---|
| Uranium 233/234 | E+01 | E 07 |
| Uranium 235 | E+01 | E 07 |
| Uranium 238 | E 01 | E 05 |
| **Organic Constituent** | **Source multiplier** | **Order of magnitude of output results ($ug/m^3$ for concentration $ug/m^2$ s for deposition)** |
| Aroclor 1254 | E+03 | E 09 |
| Benzo(a)anthracene | E+03 | E 09 |
| Benzo(a)pyrene | E+03 | E 09 |
| Benzo(b)fluoranthene | E+03 | E 09 |
| Dibenzo(a h)anthracene | E+03 | E 09 |
| Fluoranthene | E+03 | E 09 |
| Indeno(1 2 3 c d)pyrene | E+03 | E 09 |
| Pyrene | E+03 | E 09 |
| **Metal Constituent** | **Source multiplier** | **Order of magnitude of output results ($mg/m^3$ for concentration $mg/m^2$ s for deposition)** |
| Copper | E+03 | E 09 |
| Mercury | E+05 | E 11 |
| Silver | E+05 | E 11 |

## Table 5 30

### Fugitive Dust Model Determination of Card 14A Input Parameters for Americium 241

| | | | | |
|---|---|---|---|---|
| Wind erosion potential equation $P(u) = 58(u \quad u_t)^2 \quad 25(u \quad u_t)$ where friction velocity u = 0 062 x 10-m wind speed u threshold friction velocity $u_t$ = 1 17 m/s | | Coefficients in wind erosion potential equation P(u) | | |
| | | 0 222952 | 6 86464 | 50 1462 |
| Divide coefficients in P(u) equation by 3 600 s/hr to obtain coefficients for hourly emission rate equation, $E_{PM}$ | | Coefficients in fugitive particulate matter emission rate equation $E_{PM}$ | | |
| | | 6 19311E 05 | 1 90684E 03 | 1 39295E 02 |
| Multiply coefficients in $E_{PM}$ equation by a selected multiplier (Table GM 5 5 5 3) for Am 241 1 00E+04 | | Coefficients in fugitive particulate matter emission rate equation $E_{PM}$ | | |
| | | 6 19311E 01 | 1 90684E+01 | 1 39295E+02 |
| Multiply coefficients in $E_{PM}$ equation by constituent concentrations in soil | | Coefficients in contaminant emission rate equation $E_{ont\ m \quad t}$ Card 14A coefficients | | |
| Source number | Americium 241 concentration in soil (pCi/g) | $G_1$ | $G_2$ | $G_3$ |
| 1 | 2 30E 02 | 1 42442E 02 | 4 38574E 01 | 3 20379E+00 |
| 2 | 0 00E+00 | 0 00000E+00 | 0 00000E+00 | 0 00000E+00 |
| 3 | 8 40E 02 | 5 20221E 02 | 1 60175E+00 | 1 17008E+01 |
| 4 | 2 00E 02 | 1 23862E 02 | 3 81369E 01 | 2 78590E+00 |
| 5 | 2 00E 02 | 1 23862E 02 | 3 81369E 01 | 2 78590E+00 |

# Table 5-31A

## Fugitive Dust Model Near Group Receptors for Area Sources of Radionuclides

| Receptor number | Description | x-coordinate (meters) | y-coordinate (meters) |
|---|---|---|---|
| 1 | East of Sources 1 & 2 | 25 040 30 | 14 666 03 |
| 2 | East of Sources 1 & 2 | 25 040 30 | 14 635 55 |
| 3 | East of Sources 1 & 2 | 25 040 30 | 14 605 07 |
| 4 | East of Sources 1 & 2 | 25 040 30 | 14 574 59 |
| 5 | East of Sources 1 & 2 | 25 040 30 | 14 544 11 |
| 6 | East of Sources 1 & 2 | 25 040 30 | 14 513 63 |
| 7 | East of Sources 1 & 2 | 25 040 30 | 14 483 15 |
| 8 | East of Source 3 | 24 767 90 | 14 592 64 |
| 9 | East of Source 4 | 24 461 94 | 14 576 85 |
| 10 | East of Source 4 | 24 461 94 | 14 546 37 |
| 11 | East of Source 4 | 24 461 94 | 14 515 89 |
| 12 | East of Source 4 | 24 461 94 | 14 485 41 |
| 13 | East of Source 4 | 24 461 94 | 14 454 93 |
| 14 | East of Source 4 | 24 461 94 | 14 424 45 |
| 15 | East of Source 4 | 24 461 94 | 14 393 97 |
| 16 | East of Source 5 | 24 601 01 | 14 576 85 |
| 17 | East of Source 5 | 24 601 01 | 14 546 37 |
| 18 | East of Source 5 | 24 601 01 | 14 515 89 |
| 19 | East of Source 5 | 24 601 01 | 14 485 41 |
| 20 | East of Source 5 | 24 601 01 | 14 454 93 |
| 21 | East of Source 5 | 24 601 01 | 14 424 45 |
| 22 | East of Source 5 | 24 601 01 | 14 393 97 |
| 23 | OU5 Sampler 102 | 23 781 61 | 14 580 18 |
| 24 | OU5 Sampler 100 | 25 131 49 | 14 537 28 |
| 25 | OU5 Sampler 101 | 24 642 66 | 14 489 62 |

## Table 5-31B

## Fugitive Dust Model Near Group Receptors For Area Sources of Organic and Metal Constituents

| Receptor number | Description | x coordinate (meters) | y coordinate (meters) |
|---|---|---|---|
| 1 | East of Sources 1 2 3&4 | 25 026 81 | 14 690 37 |
| 2 | East of Sources 1 2 3&4 | 25 026 81 | 14 659 89 |
| 3 | East of Sources 1 2 3&4 | 25 026 81 | 14 629 41 |
| 4 | East of Sources 1 2 3&4 | 25 026 81 | 14 598 93 |
| 5 | East of Sources 1 2 3&4 | 25 026 81 | 14 568 45 |
| 6 | East of Sources 1 2 3&4 | 25 026 81 | 14 537 97 |
| 7 | East of Sources 1 2 3&4 | 25 026 81 | 14 507 49 |
| 8 | East of Sources 1 2 3&4 | 25 026 81 | 14 477 01 |
| 9 | East of Sources 1 2 3&4 | 25 026 81 | 14 446 53 |
| 10 | East of Source 5 | 24 603 15 | 14 572 82 |
| 11 | East of Source 5 | 24 603 15 | 14 542 34 |
| 12 | East of Source 5 | 24 603 15 | 14 511 86 |
| 13 | East of Source 5 | 24 603 15 | 14 481 38 |
| 14 | East of Source 5 | 24 603 15 | 14 450 90 |
| 15 | East of Source 5 | 24,603 15 | 14,420 42 |

## Table 5-31C

## Fugitive Dust Model OU 5 "Grid Group Receptors

| Receptor number | Description | x coordinate (meters) | y-coordinate (meters) |
|---|---|---|---|
| 1 | Grid receptor | 24 079 | 13 716 |
| 2 | Grid receptor | 24 079 | 14 021 |
| 3 | Grid receptor | 24 079 | 14 326 |
| 4 | Grid receptor | 24 384 | 13 716 |
| 5 | Grid receptor | 24 384 | 14 021 |
| 6 | Grid receptor | 24 384 | 14 326 |
| 7 | Grid receptor | 24 384 | 14 630 |
| 8 | Grid receptor | 24 689 | 13 716 |
| 9 | Grid receptor | 24 689 | 14 021 |
| 10 | Grid receptor | 24 689 | 14 326 |
| 11 | Grid receptor | 24 689 | 14 630 |
| 12 | Grid receptor | 24 994 | 13 716 |
| 13 | Grid receptor | 24 994 | 14 021 |
| 14 | Grid receptor | 24 994 | 14 326 |
| 15 | Grid receptor | 24 994 | 14 630 |
| 16 | Grid receptor | 25 298 | 13 716 |
| 17 | Grid receptor | 25 298 | 14 021 |
| 18 | Grid receptor | 25 298 | 14 326 |
| 19 | Grid receptor | 25 298 | 14 630 |
| 20 | Grid receptor | 25 603 | 13 716 |
| 21 | Grid receptor | 25 603 | 14 021 |
| 22 | Grid receptor (maximum AOC3 receptor) | 25 603 | 14 326 |
| 23 | Grid receptor | 25 908 | 13 716 |
| 24 | Grid receptor | 25 908 | 14 201 |
| 25 | Grid receptor | 25 908 | 14 326 |
| 26 | Grid receptor | 26 213 | 13 716 |
| 27 | Grid receptor | 26 213 | 14 201 |
| 28 | Grid receptor | 26 213 | 14 326 |

## Table 5 31C (Continued)

| | | | |
|---|---|---|---|
| 29 | Grid receptor | 26 213 | 14 630 |
| 30 | Grid receptor | 26 518 | 14 021 |
| 31 | Grid receptor | 26 518 | 14 326 |
| 32 | Grid receptor | 26 518 | 14 630 |
| 33 | Grid receptor | 26 822 | 14 021 |
| 34 | Grid receptor | 26 822 | 14 326 |
| 35 | Grid receptor | 26 822 | 14 630 |
| 36 | Grid receptor | 27 127 | 14 326 |
| 37 | Grid receptor | 27 127 | 14 630 |
| 40 | RAAMP sampler 13 | 25 039 05 | 14 700 44 |
| 41 | RAAMP sampler 14 | 24 608 47 | 14 774 94 |
| 42 | RAAMP sampler 23 | 25 611 67 | 14 536 11 |
| 43 | RAAMP sampler 32 | 22 250 | 15 621 |
| 44 | RAAMP sampler 38 | 28 624 85 | 13,949 07 |

## Table 5 32

### Comparison of OU 5 Ambient Air Data with Fugitive Dust Model Results

| OU5 Sample r | Ambient data +/ error (pCi/m$^3$) | FDM value (pCi/m$^3$) |
|---|---|---|
| | Americium 241 | |
| S102 | 1 80E 05+/ 0 48E 05 | 0 |
| S101 | 1 68E 05+/ 0 56E 05 | 1 69E 07 |
| S100 | 1 14E 05+/ 0 37E 05 | 9 43E 09 |
| | Plutonium 239/240 | |
| S102 | 9 53E 07+/ 7 04E 07 | 0 |
| S101 | 1 27E 06+/ 1 23E 06 | 5 34E 07 |
| S100 | 0+/ 7 19E 07 | 3 60E 08 |
| | Uranium 233/234 | |
| S102 | 5 50E 05+/ 2 77E 05 | 0 |
| S101 | 8 06E 05+/ 2 75E 05 | 6 48E 05 |
| S100 | 9 06E 05+/ 3 02E 05 | 1 31E 05 |
| | Uranium 235 | |
| S102 | 2 98E 06+/ 6 01E 06 | 0 |
| S101 | 5 06E 06+/ 6 67E 06 | 5 32E 06 |
| S100 | 5 83E 06+/ 6 74E 06 | 2 83E 06 |
| | Uranium 238 | |
| S102 | 5 95E 05+/ 2 86E 05 | 0 |
| S101 | 7 51E 05+/ 2 59E 05 | 3 06E 04 |
| S100 | 7 06E 05+/ 2 58E 05 | 1 51E 04 |

Notes See text Section 5 3 3 5 Verification Ambient data represent the period December 30 1992 through January 26 1993 FDM values represent the period January 1 1993 through January 31 1993

## Table 5 33A

**Fugitive Dust Model Results for Selected OU 5 Receptors
Maximum Annual (1990) Averages
Radionuclides**

| Receptor | Uranium 233/234 | Uranium 235 | Uranium 238 |
|---|---|---|---|
| Maximum AOC1 exposure | 6 56E-05 | 1 55E-05 | 8 78E 04 |
| Maximum AOC2 exposure | 6 05E-05 | 8 28E 06 | 3 58E-04 |
| Maximum AOC3 exposure | 3 65E-06 | 4 80E-07 | 2 52E 05 |

| Receptor | Uranium 233/234 | Uranium 235 | Uranium 238 |
|---|---|---|---|
| Maximum AOC1 exposure | 4 45E-06 | 1 06E 06 | 5 98E 05 |
| Maximum AOC2 exposure | 4 54E-06 | 6 46E-07 | 2 79E-05 |
| Maximum AOC3 exposure | 1 57E-07 | 2 11E-08 | 1 11E-06 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC3 is Woman Creek drainage

## Table 5-33B

**Fugitive Dust Model Results for Selected OU 5 Receptors**
**Maximum Annual (1990) Averages**
**Organic Chemicals of Concern**

| Receptor | Aroclor 1254 | Benzo(a)anthracene | Benzo(b)fluoranthene | Benzo(a)pyrene |
|---|---|---|---|---|
| | Annual average ambient air concentration ($ug/m^3$) | | | |
| Maximum AOC1 exposure | 3 78E-06 | 1 74E-05 | 1 89E-05 | 1 60E 05 |
| Maximum AOC2 exposure | 0 | 0 | 4 00E-08 | 4 86E-07 |
| Maximum AOC3 exposure | 1 61E 07 | 1 65E-07 | 1 85E-07 | 1 41E 07 |
| | Annual average deposition ($ug/m^2$ s) | | | |
| Receptor | Aroclor 1254 | Benzo(a)anthracene | Benzo(b)fluoranthene | Benzo(a)pyrene |
| Maximum AOC1 exposure | 2 82E-07 | 1 38E-06 | 1 05E-06 | 1 28E 06 |
| Maximum AOC2 exposure | 0 | 0 | 2 08E-09 | 3 51E 08 |
| Maximum AOC3 exposure | 7 41E-09 | 7 61E-09 | 8 54E-09 | 6 48E-09 |

## Table 5-33B (Continued)

| | Annual average ambient air concentration (ug/m³) | | | |
|---|---|---|---|---|
| Receptor | Dibenzo(a h)anthracene | Fluoranthene | Indeno(1 2 3 c d)pyrene | Pyrene |
| Maximum AOC1 exposure | 3 51E 06 | 4 82E 05 | 1 15E 05 | 4 27E 05 |
| Maximum AOC2 exposure | 6 50E 08 | 4 72E 07 | 9 45E 08 | 5 59E 07 |
| Maximum AOC3 exposure | 6 47E 08 | 2 43E 07 | 7 95E 08 | 2 77E 07 |

| | Annual average deposition (ug/m² s) | | | |
|---|---|---|---|---|
| Receptor | Dibenzo(a h)anthracene | Fluoranthene | Indeno(1 2 3 c d)pyrene | Pyrene |
| Maximum AOC1 exposure | 2 74E 07 | 3 87E-06 | 6 36E 07 | 3 42E 06 |
| Maximum AOC2 exposure | 4 68E-09 | 3 40E-08 | 4 90E-09 | 4 03E 08 |
| Maximum AOC3 exposure | 2 98E-09 | 1 12E-08 | 3 67E-09 | 1 28E 08 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC3 is Woman Creek drainage

## Table 5-33C

## Fugitive Dust Model Results for Selected OU 5 Receptors
## Maximum Annual (1990) Averages
## Metals Chemicals of Concern

| | Annual average ambient air concentration ($mg/m^3$) | | |
|---|---|---|---|
| Receptor | Copper | Mercury | Silver |
| Maximum AOC1 exposure | 1 70E-07 | 7 17E 12 | 5 74E 11 |
| Maximum AOC2 exposure | 9 57E 08 | 4 17E 12 | 0 |
| Maximum AOC3 exposure | 9 49E-09 | 4 03E 11 | 2 44E 10 |
| | **Annual average deposition ($mg/m^2$ s)** | | |
| Receptor | Copper | Mercury | Silver |
| Maximum AOC1 exposure | 1 26E 08 | 5 3E 13 | 4 27E 12 |
| Maximum AOC2 exposure | 6 90E-09 | 3 0E 13 | 0 |
| Maximum AOC3 exposure | 4 29E 10 | 1 82E 12 | 1 12E 11 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC3 is Woman Creek drainage

Table 5-34A

**Fugitive Dust Model Results for Selected OU 5 Receptors**
**Maximum 1990 24 Hour Averages**
**Radionuclides**

| Receptor | Uranium 233/234 | Uranium 235 | Uranium 238 |
|---|---|---|---|
| Maximum AOC1 exposure | 2 27E-02 | 5 41E-03 | 3 06E 01 |
| Maximum AOC2 exposure | 1 86E-02 | 2 58E 03 | 1 11E-01 |
| Maximum AOC3 exposure | 1 21E-03 | 1 65E 04 | 8 63E-03 |

| Receptor | Uranium 233/234 | Uranium 235 | Uranium 238 |
|---|---|---|---|
| Maximum AOC1 exposure | 1 54E-03 | 3 68E 04 | 2 08E-02 |
| Maximum AOC2 exposure | 1 38E-03 | 1 99E-04 | 8 56E-03 |
| Maximum AOC3 exposure | 5 10E-05 | 7 14E-06 | 3 72E-04 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC3 is Woman Creek drainage

## Table 5 34B

### Fugitive Dust Model Results for Selected OU 5 Receptors
### Maximum 1990 24 Hour Averages
### Organic Chemicals of Concern

| | 24 hour average ambient air concentration (ug/m$^3$) | | | |
|---|---|---|---|---|
| Receptor | Aroclor 1254 | Benzo(a)anthracene | Benzo(b)fluoranthene | Benzo(a)pyrene |
| Maximum AOC1 exposure | 1 18E-03 | 5 01E-03 | 5 46E-03 | 4 60E 03 |
| Maximum AOC2 exposure | 0 | 0 | 1 26E-05 | 1 53E-04 |
| Maximum AOC3 exposure | 5 65E-05 | 5 79E-05 | 6 51E-05 | 4 92E 05 |

| | 24 hour average deposition (ug/m$^2$ s) | | | |
|---|---|---|---|---|
| Receptor | Aroclor 1254 | Benzo(a)anthracene | Benzo(b)fluoranthene | Benzo(a)pyrene |
| Maximum AOC 1 exposure | 8 73E-05 | 3 92E 04 | 2 96E 04 | 3 61E 04 |
| Maximum AOC2 exposure | 0 | 0 | 6 44E-07 | 1 09E 05 |
| Maximum AOC3 exposure | 2 57E-06 | 2 64E-06 | 2 97E-06 | 2 23E-06 |

## Table 5-34B (Continued)

| Receptor | Dibenzo(a h)anthracene | Fluoranthene | Indeno(1 2 3 c d)pyrene | Pyrene |
|---|---|---|---|---|
| | 24 hour average ambient air concentration (ug/m ) | | | |
| Maximum AOC1 exposure | 1 03E-03 | 1 37E-02 | 3 28E-03 | 1 22E 02 |
| Maximum AOC2 exposure | 2 04E-05 | 1 49E-04 | 2 96E 05 | 1 75E 04 |
| Maximum AOC3 exposure | 2 27E-05 | 8 51E-05 | 2 79E 05 | 9 70E 05 |
| | 24 hour average deposition (ug/m$^2$ s) | | | |
| Receptor | Dibenzo(a h)anthracene | Fluoranthene | Indeno(1 2 3 c d)pyrene | Pyrene |
| Maximum AOC1 exposure | 7 89E-05 | 1 09E-03 | 1 79E 04 | 9 62E-04 |
| Maximum AOC2 exposure | 1 46E-06 | 1 06E-05 | 1 51E-06 | 1 25E-05 |
| Maximum AOC3 exposure | 1 03E-06 | 3 88E-06 | 1 27E-06 | 4 41E-06 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC 3 is the Woman Creek drainage

## Table 5-34C

### Fugitive Dust Model Results for Selected OU 5 Receptors
### Maximum 1990 24 Hour Averages
### Metals Chemicals of Concern

| | 24 hour average ambient air concentration ($mg/m^3$) | | |
|---|---|---|---|
| Receptor | Copper | Mercury | Silver |
| Maximum AOC1 exposure | 5 31E-05 | 2 23E-09 | 1 80E-08 |
| Maximum AOC2 exposure | 3 00E-05 | 1 31E-09 | 0 |
| Maximum AOC3 exposure | 3 25E-06 | 1 38E-08 | 8 66E-08 |
| | 24 hour average deposition ($mg/m^2$ s) | | |
| Receptor | Copper | Mercury | Silver |
| Maximum AOC1 exposure | 3 90E-06 | 1 64E 10 | 1 32E-09 |
| Maximum AOC2 exposure | 2 14E-06 | 9 35E 11 | 0 |
| Maximum AOC3 exposure | 1 45E-07 | 6 13E 10 | 3 90E-09 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC 3 is the Woman Creek drainage

## Table 5-35A

### Fugitive Dust Model Results for Selected OU 5 Receptors
### Maximum 1990 1 Hour Averages
### Radionuclides

| Receptor | Uranium 233/234 | Uranium 235 | Uranium 238 |
|---|---|---|---|
| Maximum AOC1 exposure | 1 78E-01 | 4 26E-02 | 2 41E00 |
| Maximum AOC2 exposure | 6 96E-02 | 9 51E-03 | 4 07E 01 |
| Maximum AOC3 exposure | 4 89E-03 | 7 93E-04 | 4 32E-02 |

| Receptor | Uranium 233/234 | Uranium 235 | Uranium 238 |
|---|---|---|---|
| Maximum AOC1 exposure | 1 22E-02 | 2 92E-03 | 1 66E-01 |
| Maximum AOC2 exposure | 5 25E-03 | 7 49E-04 | 3 21E-02 |
| Maximum AOC3 exposure | 2 13E-04 | 3 63E-05 | 1 98E 03 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC3 is Woman Creek drainage

## Table 5 35B

**Fugitive Dust Model Results for Selected OU 5 Receptors**
**Maximum 1990 1 Hour Averages**
**Organic Chemicals of Concern**

| | 1 hour average ambient air concentration ($ug/m^3$) | | | |
|---|---|---|---|---|
| Receptor | Aroclor 1254 | Benzo(a)anthracene | Benzo(b)fluoranthene | Benzo(a)pyrene |
| Maximum AOC1 exposure | 5 58E-03 | 2 18E-02 | 2 37E-02 | 2 02E-02 |
| Maximum AOC2 exposure | 0 | 0 | 4 73E 05 | 5 70E 04 |
| Maximum AOC3 exposure | 3 57E-04 | 3 94E-04 | 4 40E-04 | 3 14E-04 |

| | 1-hour average deposition ($ug/m^2$ s) | | | |
|---|---|---|---|---|
| Receptor | Aroclor 1254 | Benzo(a)anthracene | Benzo(b)fluoranthene | Benzo(a)pyrene |
| Maximum AOC1 exposure | 4 35E-04 | 1 76E-03 | 1 35E-03 | 1 63E 03 |
| Maximum AOC2 exposure | 0 | 0 | 2 51E-06 | 4 16E-05 |
| Maximum AOC3 exposure | 1 65E-05 | 1 82E-05 | 2 03E-05 | 1 45E-05 |

## Table 5-35B (Continued)

| | 1 hour average ambient air concentration (ug/m³) | | | |
|---|---|---|---|---|
| Receptor | Dibenzo(a h)anthracene | Fluoranthene | Indeno(1 2 3 c d)pyrene | Pyrene |
| Maximum AOC1 exposure | 4 28E-03 | 6 11E-02 | 1 45E 02 | 5 39E 02 |
| Maximum AOC2 exposure | 7 62E-05 | 5 55E-04 | 1 11E-04 | 6 50E-04 |
| Maximum AOC3 exposure | 1 45E-03 | 6 05E-04 | 1 93E-04 | 6 60E-04 |
| | 1 hour average deposition (ug/m² s) | | | |
| Receptor | Dibenzo(a h)anthracene | Fluoranthene | Indeno(1 2 3 c d)pyrene | Pyrene |
| Maximum AOC1 exposure | 3 40E-04 | 4 99E-03 | 8 27E-04 | 4 39E 03 |
| Maximum AOC2 exposure | 5 56E-06 | 4 05E-05 | 5 88E-06 | 4 74E-05 |
| Maximum AOC3 exposure | 6 70E-06 | 2 80E-05 | 8 91E-06 | 3 05E-05 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC 3 is the Woman Creek drainage

## Table 5-35C

**Fugitive Dust Model Results for Selected OU 5 Receptors**
**Maximum 1990 1 Hour Averages**
**Metals Chemicals of Concern**

| | 1 hour average ambient air concentration ($mg/m^3$) | | |
|---|---|---|---|
| Receptor | Copper | Mercury | Silver |
| Maximum AOC1 exposure | 2 46E-04 | 1 03E 08 | 8 24E 08 |
| Maximum AOC2 exposure | 1 12E-04 | 4 88E-09 | 0 |
| Maximum AOC3 exposure | 1 59E-05 | 6 70E-08 | 5 32E-07 |

| | 1 hour average deposition ($mg/m^2$ s) | | |
|---|---|---|---|
| Receptor | Copper | Mercury | Silver |
| Maximum AOC1 exposure | 1 92E-05 | 8 06E 10 | 6 42E 09 |
| Maximum AOC2 exposure | 8 15E-06 | 3 56E 10 | 0 |
| Maximum AOC3 exposure | 7 34E-07 | 3 08E-09 | 2 45E-08 |

Note Area of Concern 1 (AOC1) is IHSS 115 the old landfill AOC2 is IHSS 133 the ash pits AOC 3 is the Woman Creek drainage

## Table 5-36

## Indoor Air Model Input Data Requirements

| Johnson Ettinger Equations Symbol Building Characteristic | Units | Range of Values Commercial Office Building |
|---|---|---|
| Building size | $m^2$ | 557 (464-650) |
| Basement size | $m^2$ | 373 (311-436) |
| $A_B$ = area of building basement floor and walls below grade | $m^2$ | 562 (483-639) |
| $V$ = building volume | $m^3$ | 1 359 (1 113 1 586) |
| ACH = building air changes per hour | dimensionless | 0 5 (0 04 1 5) |
| $Q_{bldg}$ = building ventilation rate | $m^3/hr$ | 24 000 (680) |
| $X_{crack}$ = total floor/wall seam perimeter distance | cm | 7 730 (7 057-8 350) |
| $Z_{crack}$ = depth of crack below surface | cm | 244 |
| $r_{crack}$ = width of crack | cm | 1 9 |
| $\Delta P$ = building pressure difference relative to ambient pressure | Pa (10 g/cm $s^2$) | 1 (1 10) |
| $k_v$ = soil permeability to vapor flow | darcy ($10^{-8}$ $cm^2$) | 10 (0 01 100) |

Sources DOE 1994b EPA, 1992a Johnson and Ettinger 1991 Nihiser pers comm 1993

**Table 5-37**

**Maximum Concentrations of VOCs Identified in the IHSS 115 Soil-Gas Survey**

| Constituent | Maximum Concentration (µg/L) |
|---|---|
| tetrachloroethene (PCE) (tetrachloroethylene perchlorethylene) | 7 6 |
| 1 1 1 trichloroethane (TCA) | 13 0 |
| trichloroethene (TCE) (trichloroethylene) | 28 0 |

Source DOE 1994a

**Table 5-38**

**Vapor Viscosities of VOCs Identified in IHSS 115 Soil-Gas Survey**

| Constituent | Vapor Viscosity (g/cm s) at temperature |
|---|---|
| tetrachloroethene (PCE) (tetrachloroethylene perchlorethylene) | 0 01932 at 15°C<br>0 00798 at 30°C |
| 1 1 1 trichloroethane (TCA) | 0 00566 at 20°C<br>0 00532 at 25°C |
| trichloroethene (TCE) (trichloroethylene) | 0 00903 at 15°C<br>0 00725 at 30°C |

Source Dean 1992

**Table 5-39**

**Results of Indoor Air Modeling for OU 5 Human Health Risk Assessment**

| Constituent | Concentration in Basement Area (µg/m³) Commercial Office Building |
|---|---|
| tetrachloroethene (PCE) (tetrachloroethylene perchlorethylene) | 0 018 (0 0056 0 25) |
| 1 1 1 trichloroethane (TCA) | 0 067 (0 021 0 92) |
| trichloroethene (TCE) (trichloroethylene) | 0 23 (0 071 3 2) |

# 6 0 HUMAN HEALTH RISK ASSESSMENT

The human health risk assessment (HHRA) for OU 5 is summarized in this section The HHRA represents a portion of the BRA associated with the RFI/RI This section presents the methodology and results of the HHRA

## 6 1 INTRODUCTION

### 6 1 1 Purpose

The purpose of the OU 5 HHRA is to develop a quantitative description and assessment of the human health risks posed by the COCs at OU 5 This HHRA is incorporated in its entirety as part of the BRA for OU 5 The resulting analysis of the human health risks posed by OU 5 responds to and fulfills the requirements of Attachment 2 Section VII D Interagency Agreement. These agreements among DOE EPA and CDPHE require an analysis acceptable to both EPA and CDPHE Pursuant to this requirement, the method of evaluation is consistent with the EPA RAGS (EPA 1989)

### 6 1 2 Scope

This HHRA contains a variety of information pertinent to potential human health risks associated with OU 5 COCs are identified and an exposure assessment links the COCs to potentially exposed receptors through current or future land uses and the associated exposures COC intakes are calculated compared with EPA guidance and potential health risks are estimated Uncertainty analysis is then performed on the evaluations and results are documented

### 6 1 3 Delineation of OU 5 Contaminant Source Areas

A source area is defined as an IHSS or group of IHSSs where concentrations or activities of potential chemicals of concern (PCOCs) in any medium exceed an upper bound estimate of the background range The upper bound estimate of the background range for metals and radionuclides is defined as the background mean plus two standard deviations all detected organics are considered to be above background levels

Six OU 5 source areas were agreed to by EPA CDPHE and DOE and are listed below and generally coincide with the OU 5 IHSSs with the exception of IHSS 209 IHSS 209 is not considered a source area because only calcium exceeded the criterion of the mean plus two standard deviations In addition calcium is an essential nutrient with no applicable or relevant and appropriate requirements (ARARs) available The six physical areas are largely determined by the extent of the potential contamination and are

(1) IHSS 115/196 Source Area. This source area includes the area of IHSS 115 (the Original Landfill) and IHSS 196 (the Filter Backwash Pond) It also includes the additional area of a small margin around IHSS 115 to include associated data points

(2) IHSS 133 Source Area. This source area includes the area encompassing all of the 133 IHSSs This includes the Ash Pits (IHSS 133 1 133 2 133 3 and 133 4) the Incinerator (IHSS 133 5) and the Concrete Wash Pad (IHSS 133 6)

(3) Surface Disturbance South of IHSS 133 Source Area. This source area is located approximately 1000 feet south of the ash pits (IHSS 133) and includes areas of former excavations and associated surface soil sampling locations

(4) SID and Pond C 2 Source Area This source area includes the SID up to the Original Landfill (IHSS 115) boundary and the C 2 pond (IHSS 142 11) The SID terminates into Pond C 2

(5) Surface Disturbance West of IHSS 209 Source Area. This source area includes the Surface Disturbance area located approximately 1150 feet west of IHSS 209

(6) Woman Creek and Pond C 1 Source Area. This source area includes Woman Creek to the west boundary of the OU 5 study area and the C 1 pond (IHSS 142 10) located along the Woman Creek drainage

### 6 1 4 Determination of OU 5 Areas of Concern

AOCs are defined as one or several source areas that are in close proximity and can be evaluated as a unit in the HHRA Of the six source areas identified in OU 5 the IHSS 115/196 Source Area and the IHSS 133 Source Area are generally physically separated and are treated individually as AOCs The SID and Pond C 2 Source Area and the Woman Creek and Pond C 1 Source Areas are interrelated and are treated together as one AOC

The source area south of IHSS 133 did not exceed the CDPHE risk based conservative screen criterion and therefore is not considered an AOC The source area west of IHSS 209 slightly exceeded the CDPHE conservative screen criterion due to plutonium 239/240 in one surface soil sample The remaining samples are significantly less than the risk based concentration (RBC) and subsequent sampling was not able to reproduce the plutonium 239/240 concentration that exceeded the CDPHE conservative screen

Because the criterion was only slightly exceeded and due to a single sample of one PCOC this source area is not identified as an AOC

In summary the OU 5 AOCs are shown in Figure 6 1 and are identified as

- AOC number 1 is identical to the IHSS 115/196 Source Area
- AOC number 2 is identical to the IHSS 133 Source Area
- AOC number 3 contains the SID Pond C 1 and Pond C 2 and Woman Creek Source Areas

### 6 1 5 Chapter Organization

This HHRA is divided into nine sections Section 6 1 provides a brief introduction purpose scope OU description data aggregation and report organization It also identifies the OU 5 source areas and AOCs Section 6 2 presents the COC methodology and its application in the identification and selection of COCs Section 6 3 provides a description of how scenarios and pathways are identified and selected for quantitative analysis It discusses each current and future land use and potential receptors that could be exposed to the COCs in the context of the land uses Section 6 4 presents pathway specific information such as intake equations modeling data and exposure factors and concentrations and resulting receptor intakes Section 6 5 presents the COC toxicity information including carcinogenic and noncarcinogenic effects Section 6 6 provides the methodology and application of combining the results of the exposure assessment and the toxicity assessment It includes the numerical estimates by scenario and receptor of potential health effects and the OU 5 uncertainty analysis Section 6 7 presents a summary of the entire HHRA

## 6 2 CHEMICALS OF CONCERN IDENTIFICATION

The HHRA evaluates potential human health risks for applicable receptors under current and potential future land use conditions assuming no remedial action takes place at OU 5 COCs are metals or radionuclides whose concentration or activity statistically exceeds background concentrations or activities and organic compounds that are not naturally occurring but that could pose a human health risk under the assumed exposure conditions COCs are identified on an OU wide basis for each medium (e g groundwater and soil) through which exposure to chemicals could occur The identification of COCs will also help focus the efforts of environmental transport modeling description of the nature and extent of contamination and remedy selection

### 6 2 1 Selection Process for Chemicals of Concern

COCs are selected at OU 5 for surface soil subsurface soil groundwater surface water seep water pond sediment, seep sediment and stream sediment. These media were sampled during the Phase I RFI/RI in accordance with the OU 5 Work Plan as amended (DOE 1992a) COCs are identified on an OU wide basis by pooling analytical results for samples collected from the various sampling locations for each medium

The process for selection of COCs is shown in Figure 6 2 and includes the following elements

- evaluation of data
- comparison to background concentrations
- application of professional judgement
- elimination of essential nutrients and major ions
- evaluation of detection frequency
- concentration/toxicity screen
- evaluation of risk based concentrations for infrequently detected analytes and identification of special-case COCs

### 6 2 2 Evaluation of Data

The preliminary step in the process for selection of COCs is the evaluation of analytical data for samples collected from each environmental medium Analytical data from environmental samples collected during the OU 5 field sampling program and the sitewide sampling programs were used to characterize potential contamination at OU 5 The samples used in this evaluation were collected between October 1992 and November 1993 however sampling is ongoing as data gaps are identified. The number of samples sampling locations and other features of the sampling and analytical program are discussed in the OU 5 Work Plan (DOE 1992a) various TMs and summarized in TM15 (DOE 1994a) Samples were collected from the following media

- surface soil
- subsurface soil
- groundwater
- surface water
- seep water
- pond sediment
- seep sediment
- stream sediment

The data set is described in Appendix A of TM11 (DOE 1995a) and was used to determine the OU 5 PCOCs These data are also described in Section 4 0 The COC selection process is intended to identify the chief environmental constituents in each medium that could have adverse impacts on public health The risk assessment focuses on OU 5 constituents that are potentially significant health hazards Inorganic constituents whose concentrations are below background levels or that are essential nutrients or major ions are excluded from the risk assessment Organic constituents that would contribute insignificantly to overall risk are identified and discussed in DOE (1995a) but are not included in this quantitative risk assessment.

### 6 2 3 Comparison to Background Concentrations

The evaluation of analytical data for the development of PCOCs is presented in TM11 (DOE 1995a) Analytical results for metals and radionuclides were compared to background levels derived from data for subsurface soils groundwater seeps/springs and stream sediments reported in the BGCR (DOE 1993a) and from background surface soil samples collected in the Rock Creek area during the 1991 OU 1 Phase III investigation and the 1993 OU 2 Phase II investigation Metals and radionuclides whose concentrations did not statistically exceed background levels were eliminated from further consideration as PCOCs

TM11 (DOE 1995a) presents the background comparison methodology in detail and contains summary tables of statistical results for metals and radionuclides in all media. Organic constituents were assumed to be anthropogenic in origin and are not attributable to background therefore any organic constituent detected is initially considered a PCOC

### 6 2 4 Application of Professional Judgment

The spatial and temporal distribution and the pattern of geochemical characteristics of certain metals and radionuclides identified as being above background levels were carefully evaluated using professional judgement to support a conclusion as to whether these constituents were likely to be naturally occurring or due to environmental contamination The evaluation and professional judgment are briefly described here and in more detail in TM11 (DOE 1995a) which contains discussions of professional judgement as it was applied to each medium

Based on the known histories of the OU 5 IHSSs as well as the operational history of the Site none of the radionuclides identified as PCOCs are eliminated through this process The primary radionuclides identified as PCOCs americium 241 plutonium 239/240 and the uranium isotopes are expected as site contaminants Much of the spatial and temporal distribution and geochemical characteristics of certain metals in each of the environmental media applicable to OU 5 is based on the information presented in TM15 (DOE 1994a)

### 6 2 5 Elimination of Essential Nutrients and Major Ions

Calcium iron magnesium potassium, and sodium were eliminated from further consideration as COCs because these constituents are essential nutrients occur naturally in the environment and are toxic only at very high doses (EPA 1994d) Anions in groundwater (other than nitrate) were not evaluated. The elimination of essential nutrients and major cations and anions is applied to all applicable media in OU 5

### 6 2 6 Evaluation of Detection Frequency

PCOCs that were detected at a frequency of greater than five percent were considered potential OU wide COCs These chemicals were included in concentration/toxicity screens to identify chemicals that could contribute significantly to total risk. Analytes detected at or less than five percent frequency are not considered characteristic of OU wide contamination and the potential for exposure is low Maximum concentrations of infrequently detected organic constituents and metals were compared to risk based concentrations (1000 X RBC) to identify isolated or highly localized occurrences of high concentrations (i e hot spots) that could pose a health risk if routine exposure were to occur as discussed in Section

6 2 8 Chemicals that exceeded the RBC comparison would have been retained as special-case COCs for evaluation in the risk assessment however none of the OU 5 PCOCs exceeded their respective threshold and therefore no special case COCs were retained Because DOE Order 5400 1 (DOE 1990) stipulates the use of all data (except for rejected data) for radionuclides negative values were used as reported and radionuclides were considered to be detected at 100 percent frequency

### 6 2 7 Concentration/Toxicity Screen

COCs in each medium were selected using separate concentration/toxicity screens for noncarcinogens carcinogens and radionuclides The screens included inorganics that were detected at concentrations or activities greater than background levels and at greater than five percent frequency and organic chemicals that were detected at greater than five percent frequency The purpose of applying the screen is to focus the risk assessment on the chief contributors to potential risk. To perform the screen each PCOC in a medium is scored according to its maximum detected concentration and toxicity to obtain a risk factor The risk factor for noncarcinogenic effects is the maximum detected concentration divided by the EPA reference dose (RfD) for that analyte The risk factor for carcinogenic effects (and for radionuclides) is the maximum detected concentration (or activity) multiplied by the EPA cancer slope factor (CSF) for that chemical (or radionuclide) The chemical specific risk factors are summed to calculate total risk factors for the noncarcinogenic and carcinogenic (radioactive and nonradioactive) PCOCs in each medium The ratio of the risk factor for each PCOC to the total risk factor is called a risk index the risk index approximates the relative risk associated with each PCOC in the medium Separate concentration/toxicity screens were performed for carcinogenic and noncarcinogenic effects of organic chemicals and metals and for carcinogenic effects of radionuclides Several chemicals have both noncarcinogenic and carcinogenic effects and are included in both concentration/toxicity screens The results of the concentration/toxicity screens are presented in Tables 6 1 through 6 20

Each PCOC that comprised less than one percent of the total risk factor was not considered a COC for evaluation in the quantitative risk assessment This approach reduces the number of chemicals to be carried through a risk assessment However the approach is conservative (i e health protective) because it retains some chemicals that contribute as little as one percent of the total potential risk in that medium In most cases only a few chemicals contribute the majority of potential risk in each medium

TM11 (DOE 1995a) identifies specific toxicity factors for each PCOC and how the factors were used to determine the OU 5 COCs The toxicity factors that were used in TM11 DOE (1995a) were also used to estimate human health effects in the HHRA

### 6 2 8 Evaluation of Risk Based Concentrations for Infrequently Detected Analytes and Identification of Special-Case COCs

As discussed in Section 6 2 6 analytes detected infrequently (in less than five percent of all samples in the medium) are not considered characteristic of OU wide contamination and the potential for exposure is low These constituents were further screened to include any infrequently detected analyte that could contribute significantly to risk if routine exposure to a hot spot were to occur In this analysis maximum measured concentrations were compared to screening levels equivalent to 1000 times RBCs (DOE 1995a) Any infrequently detected analyte measured at a concentration greater than 1000 times the respective RBC would have been identified as representing a potential health risk if exposure were to occur and included in the list of special case COCs for evaluation in the HHRA Tables 6 21 through 6 24 present the RBC comparisons As shown by these tables no special-case COCs were identified by the RBC comparisons Table 6 25 presents a summary of OU 5 COCs by medium

## 6 3 IDENTIFICATION OF SCENARIOS AND PATHWAYS

Potential exposure scenarios and pathways are identified using existing and potential future land uses The RME is defined as the highest exposure that is reasonably expected to occur at a site according to the EPA s concept of RME (EPA 1989) The term potential is used as a reasonable chance of occurrence within the context of the RME scenario Using this approach potential exposure routes are evaluated using a CSM In the CSM exposure pathways are evaluated by their potential contribution to exposure and classified as significant insignificant, and negligible or incomplete Significant pathways are potentially complete pathways that involve relatively direct exposure or only moderately reduced concentrations due to contaminant fate and transport. Insignificant pathways are potentially complete pathways that are expected to result in exposure concentrations one or more orders of magnitude lower than significant exposure pathways Negligible pathways are potentially complete pathways where either direct exposure is expected to be negligible or fate and transport is expected to reduce contaminant concentrations by several orders of magnitude or more in comparison to significant exposure pathways

Incomplete pathways are those where the exposure to the potential receptor is expected to be blocked or incomplete Both significant and insignificant pathways will be evaluated quantitatively

This section discusses current and future land uses potential human receptors and associated scenarios and pathways

### 6 3 1 Current and Future Land Use

In general current land use surrounding the Site includes open space agricultural residential office gravel mining and commercial/industrial Table 6 26 summarizes the current patterns of land use at OU 5 and near the Site the table also identifies potential future land use Future land use scenarios are identified as improbable (scenarios that are unlikely to occur) or credible (scenarios that could reasonably occur or are expected to occur) Current and future land uses both offsite and onsite (OU 5) are discussed in more detail in TM11 DOE (1995b)

Current activities within OU 5 consist of environmental investigations monitoring cleanup and routine security surveillance The Site operations and maintenance activities are not conducted within OU 5 Future onsite residential and agricultural development is inconsistent with land use plans for the area (RFETS 1995) Future land use would more likely involve industrial complexes at the developed portions of the Site and open space uses in the buffer zone The portions of OU 5 with suitable topography will also be evaluated further for construction of and subsequent use of an office complex Thus onsite use of office facilities and designation of the buffer zone as an ecological preserve and/or open space were considered to be credible future land use scenarios for OU 5 and are consistent with the recommendations of the Rocky Flats Future Site Use Working Group (RFETS 1995)

### 6 3 2 Evaluation of Potential Human Receptors

Current and future human population groups on and near the site are potential candidates for evaluation (i e receptors) based on their likelihood of exposure to site related COCs EPA guidance does not require an exhaustive assessment of every potential receptor and exposure scenario (EPA 1992) Rather the highest potential exposures that are reasonably expected to occur should be evaluated along with an assessment of any associated uncertainty (EPA 1989) However all potential receptors have been identified and evaluated to ensure that important exposure pathways or receptors were not overlooked

Potential human receptors on and near the OU 5 study area are current and future residents current and future onsite workers future onsite ecological researchers and future open space receptors (DOE 1995b)

Current and future residents include OU 5 onsite and offsite residential receptors The current and future offsite residential receptor potentially receives exposures of contaminants from the entire plant site and not just OU 5 Because OU 5 contributes only a portion of the potential exposures to this receptor the current and future offsite resident will not be evaluated further in the OU 5 HHRA (DOE 1995b) Future onsite residential development is also inconsistent with future land use plans therefore a future onsite residential receptor will not be evaluated further in the OU 5 HHRA (RFETS 1995)

Current and future OU 5 onsite workers include current onsite security personnel future office complex workers and future construction workers It is assumed that the current onsite security workers will continue to provide security services to the OU 5 study area and that most of the security work will continue to be performed from patrol vehicles Also to be conservative the site specific exposure factors for a current onsite industrial worker will be used for the current onsite security worker Because some OU 5 locations may be suitable for an office complex a future office worker and a future construction worker to build the complex will be evaluated in the OU 5 HHRA

Because it is credible that the OU 5 study area may be preserved as an ecological reserve or as open space a future onsite ecological researcher and a future onsite open space receptor will be evaluated in the OU 5 HHRA

A CSM (Figure 6 3) was used to evaluate potential exposure routes The CSM documents each potential exposure by potential contribution to each human receptor The exposure is classified as significant insignificant, and negligible or incomplete

### 6 3 3 Receptor Locations and Exposure Areas

For HHRAs conducted at the Site onsite exposures will be evaluated in separate AOCs identified in the OU A discussion of the OU 5 AOCs is in Section 6 1 4 Determination of OU 5 Areas of Concern Grids are typically placed over each AOC to define the areas in which a potential receptor can reasonably be expected to come in contact with COCs Default grid sizes are 10 acres for a residential receptor 30 acres for an industrial or office worker and 50 acres for an ecological researcher or open space recreational user However the largest AOC identified at OU 5 is AOC 2 with 24 5 acres and the chosen grid size should be appropriate for the potential receptors Because a residential receptor is not appropriate as discussed in Section 6 3 2 the next largest grid size is 30 acres which is larger than any of the three OU 5 AOCs Therefore all applicable receptors will be assessed on an AOC wide basis This results in calculating and using 95 percent upper confidence limit (UCL) exposure concentrations on an AOC wide basis and using AOC wide modeling results to calculate potential health effects for each applicable receptor in each AOC

Using chemical sampling data and fate and transport modeling as appropriate the exposure point concentrations and activities are used to quantitatively evaluate chemical intakes for potential receptors Table 6 27 identifies current and future receptors and potentially complete pathways as associated with specific AOCs Details regarding the selection of the five receptors and their associated pathways can be found in TM12 DOE (1995b)

## 6 4 EXPOSURE ASSESSMENT

Pathway specific exposures or intakes are quantified through the use of intake equations exposure parameters and exposure concentrations Intake equations are pathway specific whereas exposure parameters and exposure concentrations are both scenario specific and pathway specific Depending on the pathway exposure concentrations may be statistically derived directly from field investigation data, or may be modeled using fate and transport models or estimation techniques This section first presents exposure concentrations and modeling followed by exposure factors intake equations and then the resulting intakes

### 6 4 1 Exposure Concentrations and Modeling

Where appropriate measured chemical specific concentrations in surface soil subsurface soil groundwater seep water and seep sediment were used to calculate 95% UCLs The method used to calculate 95% UCLs is consistent with the EPA guidance Calculating the Concentration Term for Risk Assessment (EPA 1994a) Concentrations of COCs suspended in air were estimated using an air dispersion model (Fugitive Dust Model) and are discussed in detail in Section 5 3 3 Groundwater and surface water modeling are discussed in Section 5 3 1 and Section 5 3 2 respectively Concentrations for each COC have been calculated separately for each of the three AOCs and are used to calculate separate intakes Tables 6 28 through 6 30 present chemical specific concentrations in AOC1 AOC2 and AOC3 that were used to calculate OU 5 intakes

Concentrations for each COC to be used in the risk assessment were calculated using the method consistent with EPA s Calculating the Concentration Term for Risk Assessment, (EPA 1994a) Where numerous groundwater and surface water samples were taken at the same sampling location over a period of time these concentrations were averaged and then the averages were used in the equations to calculate the respective 95% UCLs Also based on EPA guidance (EPA 1992c) all UCLs were calculated assuming lognormal distributions of the data populations The specific cases where this approach was not appropriate are discussed below

The groundwater sample sizes in AOC1 were small and large variations in concentrations were noted Therefore the calculated 95% UCLs were not appropriate and maximum measured concentrations were conservatively used Sample sizes for seep water and seep sediments in AOC1 were also small and not appropriate for calculating 95% UCLs therefore maximum concentrations were used.

Only one well in AOC2 was available for sampling of groundwater resulting in a small sample size Therefore calculating a 95% UCL was not appropriate and the maximum concentrations were used Sample sizes for seep water and seep sediments in AOC2 were also small and were not appropriate for calculating 95% UCLs therefore maximum concentrations were used

Two wells in AOC3 were available for sampling groundwater and there was a small sample size therefore calculating 95% UCLs was not appropriate and maximum concentrations were used Stream sediment

Two wells in AOC3 were available for sampling groundwater and there was a small sample size therefore calculating 95% UCLs was not appropriate and maximum concentrations were used Stream sediment samples of americium 241 and plutonium 239/240 were small and therefore the 95% UCL concentrations are not appropriate For these two COCs in AOC3 stream sediment the maximum concentrations were used

### 6 4 2 Exposure Factors and Intake Equations

The Rocky Flats Site Specific Exposure Factors for Quantitative Human Health Risk Assessment were used in the intake equations and are found in Appendix M The appropriate exposure factors and chemical concentrations are incorporated into the intake equations in Sections 6 4 2 1 through 6 4 2 6 to calculate respective receptor COC intakes

#### 6 4 2 1 Incidental Ingestion of Soil Sediment and Dust

Receptor intakes may result from incidental ingestion of COCs in soil sediment and dust The following equation is used to calculate the intake

$$\textit{Intake (mg/kg day)} = \frac{CS \times IR \times CF \times FI \times ME \times EF \times ED}{BW \times AT}$$

Where

| | |
|---|---|
| CS | = Chemical concentration in soil sediment or dust (mg/kg or pCi/g) |
| IR | = Ingestion rate (mg/day) |
| CF | = Conversion factor ($10^{-6}$ kg/mg) |
| ME | = Matrix effect in GI tract (unitless) |
| FI | = Fraction ingested from contaminated source (unitless) |
| EF | = Exposure frequency (days/year) |
| ED | = Exposure duration (years) |
| BW | = Body weight (kg) |
| AT | = Averaging time (days) |

For calculation of radionuclide intakes the concentration is expressed in pCi/g and the expression is not divided by body weight and averaging time The intake for radionuclides is expressed in pCi The chemical specific matrix effects are found in Table 6 31

### 6 4 2 2 Inhalation of Airborne Contaminants

Airborne contaminants associated with complete pathways at OU 5 are in the particulate form Dermal absorption of contaminants that may be in the vapor phase is considered to be negligible in proportion to inhalation intakes and therefore is disregarded in accordance with RAGS (EPA 1989a) The following equation is used to estimate inhalation intakes

$$\mathit{Intake}\ (mg/kg\ day) = \frac{CA \times IR \times RF \times RDF \times ET \times EF \times ED}{BW \times AT}$$

Where

| | |
|---|---|
| CA | = Contaminant concentration in air ($mg/m^3$ or $pCi/m^3$) |
| IR | = Inhalation rate ($m^3$/hour) |
| RF | = Respirable fraction (unitless) |
| RDF | = Respiratory deposition factor (unitless) |
| ET | = Exposure time (hours/day) |
| EF | = Exposure frequency (days/year) |
| ED | = Exposure duration (years) |
| BW | = Body weight (kg) |
| AT | = Averaging time (days) |

For calculation of intakes from inhalation of particulates only the fraction of the particulate concentration in air that is considered to be respirable (<10 $\mu$m) is evaluated Air dispersion modeling performed for OU 5 considered particle size and therefore the air concentrations are the respirable particulates only The respirable fraction parameter for inhalation of airborne contaminants at OU 5 is therefore always 1 0 The respiratory model developed by the International Commission on Radiological Protection indicates that particles with sizes above 10 $\mu$m are relatively unimportant contributors to internal dose (NCRP 1985) For calculation of radionuclide intakes the concentration is expressed in $pCi/m^3$ and the expression is not divided by body weight and averaging time The intake for radionuclides is expressed in pCi

### 6 4 2 3 Dermal Contact with Soil and Sediments

The exposure from dermal contact with organic chemicals in soil and sediments is calculated using the following equation which results in an estimate of the absorbed dose (i e intake) not the amount of chemical in contact with the skin Exposure from dermal contact with metals and radionuclides was not estimated due to the low rate of absorption of these constituents

$$\textit{Absorbed Dose (mg/kg day)} = \frac{CS \times CF \times SA \times FC \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where

| | |
|---|---|
| CS | = Chemical concentration in soil or sediment (mg/kg) |
| CF | = Conversion factor ($10^{-6}$ kg/mg) |
| SA | = Skin surface area available for contact (cm /event) |
| FC | = Fraction contacted from contaminated source (unitless) |
| AF | = Soil to skin adherence factor (mg/cm$^2$) |
| ABS | = Skin absorption factor (unitless) |
| EF | = Exposure frequency (events/year) |
| ED | = Exposure duration (years) |
| BW | = Body weight (kg) |
| AT | = Averaging time (days) |

### 6 4 2 4 Ingestion of Surface Water and Suspended Sediment

The equation used to calculated intake from ingestion of contaminated water is presented below

$$\textit{Intake (mg/kg day)} = \frac{CW \times IR \times ER \times EF \times ED}{BW \times AT}$$

Where

| | |
|---|---|
| CW | = Chemical concentration in water (mg/liter or pCi/liter) |
| IR | = Inhalation rate (liter/hour) |
| ER | = Exposure rate (hours/day) |
| EF | = Exposure frequency (days/year) |
| ED | = Exposure duration (years) |
| BW | = Body weight (kg) |
| AT | = Averaging time (days) |

For calculation of radionuclide intakes the concentration is expressed in pCi/liter and the expression is not divided by body weight and averaging time The intake for radionuclides is expressed in pCi

### 6 4 2 5 Dermal Contact with Surface Water

The equation used for dermal contact with chemicals in surface water is presented below This equation calculates the actual absorbed dose (i e intake versus the amount of chemical that comes in contact with the skin)

$$\textit{Absorbed Dose (mg/kg day)} = \frac{CW \times CF \times SA \times PC \times ET \times EF \times ED}{BW \times AT}$$

Where

| | |
|---|---|
| CW | = Chemical concentration in water (mg/liter) |
| CF | = Volumetric conversion factor for water (1 liter/100 $cm^3$) |
| SA | = Skin surface area available for contact ($cm^2$) |
| PC | = Chemical specific dermal permeability constant (cm/hour) |
| ET | = Exposure time (hours/day) |
| EF | = Exposure frequency (days/year) |
| ED | = Exposure duration (years) |
| BW | = Body weight (kg) |
| AT | = Averaging time (days) |

The chemical specific dermal permeability constants are found in Table 6 31 Exposure from dermal contact with metals and radionuclides was not estimated due to the low rate of absorption of these constituents

### 6 4 2 6 External Radiation Exposure

Radionuclide intakes for external exposure are calculated using the following equation

$$\textit{Intake}\ (\frac{pCi \times Year}{g}) = C \times EF \times ED \times (1\ Se) \times Te$$

Where

| | |
|---|---|
| C | = Isotope activity (pCi/g) |
| EF | = Exposure frequency ratio (unitless) |
| ED | = Exposure duration (years) |
| Se | = Gamma shielding factor (unitless) |
| Te | = Gamma exposure factor (unitless) |

### 6 4 3 Calculated Intakes

In accordance with EPA guidance calculations are conducted for both central tendency (CT) and RME values for receptor intakes (EPA 1994a) The Rocky Flats site specific exposure factors in Appendix M contain both RME and CT values and were used to calculate intakes Tables 6 32 through 6-41 document the RME and CT carcinogenic chemical intakes for receptors in AOC1 Tables 6 42 through 6 51 document the RME and CT carcinogenic chemical intakes for AOC2 and Tables 6-52 through 6-55 document the RME and CT carcinogenic chemical intakes for applicable receptors in AOC3 RME and CT noncarcinogenic chemical intakes for receptors in AOC1 are found in Tables 6 56 through 6 67 Tables 6 68 through 6 79 document the RME and CT noncarcinogenic chemical intakes for AOC2 and Tables 6 80 through 6 85 document the RME and CT noncarcinogenic chemical intakes for receptors at AOC3

## 6 5 TOXICITY ASSESSMENT

Toxicity values are used to characterize potential risk and health effects and this section documents the toxicity constants for the OU 5 COCs The toxicity constants used in this risk assessment were obtained from several sources but the primary source of information was EPA s Integrated Risk Information System (IRIS) database (EPA 1994c) IRIS contains only those toxicity values that have been verified by EPA s Carcinogenic Risk Assessment Verification Endeavor (CRAVE) Work Groups The IRIS database is updated monthly and per RAGS (EPA 1989) supersedes all other sources of toxicity information If the necessary data are not available in IRIS EPA s most recent issue of Health Effects Assessment Summary Tables (HEAST) is used (EPA 1994b) The HEAST tables are published annually and updated approximately two times per year HEAST contains a comprehensive listing of provisional risk assessment information that has undergone review and has the concurrence of individual EPA Program Offices but has not had enough review to be recognized as high quality agency wide consensus information (EPA 1994b) Additional sources of information used in this risk assessment include the EPA Environmental Criteria and Assessment Office (ECAO) and guidance from EPA toxicologists

The COCs identified in TM11 (DOE 1995a) have verified toxicity values available from IRIS or HEAST except for the chemicals that are documented in EG&G Rocky Flats Inc memo 94 RF 11283 (EG&G 1993c) Table 6 30 provides a summary of the OU 5 COCs and their respective toxicity information that was used for the risk characterization Additional detail and references for toxicity values can be found in TM11 (DOE 1995a) and the OU 5 toxicity letter (EG&G 1993c)

The following four sections discuss toxicity assessments specific to noncarcinogenic and carcinogenic chemicals

### 6 5 1 Toxicity Assessment for Noncarcinogenic Effects

Potential noncarcinogenic effects will be evaluated in the risk characterization by comparing daily intakes with chronic RfDs developed by EPA This section provides a definition of an RfD and discusses how it is applied in the risk assessment

A chronic RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure that can be incurred during a lifetime without an appreciable risk of a noncancer effect being incurred in human populations including sensitive subgroups (EPA 1989) The RfD is based on the assumption that thresholds exist for noncarcinogenic toxic effects (e g liver or kidney damage) RfDs are typically presented in units of mg/kg-day and are calculated by dividing a dose (representing a no observed adverse affect level or a lowest-observed adverse effect level) at which there are no significant measurable effects produced by an uncertainty or safety factor that typically ranges from 10 to 10 000 Thus there should be no adverse effects associated with chronic daily intakes at or below the RfD value Conversely if chronic daily intakes exceed this threshold level there is a potential that some adverse noncarcinogenic health effects might be observed in exposed individuals

RfDs have been derived by EPA for both oral and inhalation exposures However in January 1991 EPA decided to replace inhalation RfDs with reference concentrations (RfCs) RfCs are expressed in terms of concentrations in air ($mg/m^3$) not in terms of dose or mg/kg-day An RfC may be converted to a corresponding inhaled dose (mg/kg-day) by dividing by 70 kg (an estimated human body weight) multiplying by 20 $m^3$/day (an assumed human inhalation rate) and adjusting by an appropriate absorption factor (EPA 1994b)

## 6 5 2 Toxicity Assessment for Carcinogenic Effects

Potential carcinogenic risks are expressed as an estimated probability that an individual may develop cancer from lifetime exposure This probability is based on projected intakes and chemical specific dose response data or Cancer Slope Factors (CSFs) CSFs and the estimated daily intake of a compound averaged over a lifetime of exposure are used to estimate the incremental risk of an individual exposed to that compound developing cancer There are two classes of potential carcinogens nonradioactive and radioactive chemicals For the purposes of this toxicity assessment each of these two classes of elements or compounds are discussed separately

### 6 5 2 1 Toxicity Assessment for Nonradioactive Chemical Carcinogens

Evidence of chemical carcinogenicity originates primarily from two sources lifetime studies with laboratory animals and human (epidemiological) studies For most such chemical carcinogens animal data from laboratory experiments represent the primary basis for the extrapolation Effects from exposure to high (i e administered) doses are based on laboratory animal bioassay results whereas efects associated with exposure to low doses of a chemical are generally estimated from mathematical models

For these nonradioactive chemical carcinogens EPA assumes a small number of molecular events can evoke changes in a single cell that can lead to uncontrolled cellular proliferation and tumor induction This mechanism for carcinogenesis is referred to as stochastic which means that there is theoretically no level of exposure to a given chemical carcinogen that does not pose a small but finite probability of generating a carcinogenic response Because risk at low exposure levels cannot be measured directly either in laboratory animals or human epidemiology studies various mathematical models have been proposed to extrapolate from high to low doses

Consistent with guidance in RAGS (EPA 1989) PAHs that have been identified as COCs in OU 5 will not be quantitatively evaluated for dermal exposure RAGS states It is inappropriate to use the oral slope factor to evaluate the risks associated with dermal exposure to carcinogens such as benzo(a)pyrene which cause skin cancer through a direct action at the point of application RAGS also states Generally only a qualitative assessment of risks from dermal exposure to these chemicals is possible The PAHs in OU 5 are benzo(a)anthracene benzo(a)pyrene benzo(b)fluoranthene, dibenzo(a,h)anthracene fluoranthene indeno(1 2 3 cd)pyrene and pyrene

Uncertainties in the toxicity assessment for nonradioactive chemical carcinogens are dealt with by classifying each chemical into one of several groups according to the weight-of evidence from epidemiological studies and animal studies Table 6 86 presents specific definitions for weight of evidence

### 6 5 2 2 Toxicity Constants for Radioactive Chemicals

Extensive literature exists that describes the health effects of radionuclides on humans and animals Intensive research by national and international commissions has established universally accepted limits to which workers and the public may be exposed without clinically detectable effects This literature has resulted in EPA classifying all radioactive chemicals as Group A carcinogens because they emit ionizing radiation which, at high doses has been associated with increased cancer incidence in humans

A fundamental difference between the assessment of potential toxicity associated with exposure to radionuclide and nonradionuclide carcinogens is that CSFs for radionuclides are typically best estimates (mean or median values) rather than upper 95th percentile values Furthermore in the past, risk factors for radionuclides have generally been based on fatalities (i e the number of laboratory animals or people who actually died from cancer) whereas CSFs for nonradiological carcinogens are based on incidence (i e the number of lab animals or people who developed cancer) Finally the CSFs for radionuclides are expressed in different units [i e risk per pCi ($pCi^{-1}$) rather than $mg/kg\text{-}day^{-1}$]

## 6 6 RISK CHARACTERIZATION

Risk characterization involves estimating the magnitude of the potential adverse effects of COCs under study and summarizing risks to human health Risk characterization considers the nature and weight-of evidence supporting these risk estimates and the magnitude of uncertainty surrounding those estimates Risk characterization combines the results of the exposure and toxicity assessments to provide numerical estimates of health risk. These estimates are comparisons of exposure levels with RfDs or estimates of the lifetime cancer risk for a given intake The process of characterizing risk includes the following

- Calculating and characterizing cancer risk and potential noncarcinogenic effects
- Conducting qualitative uncertainty analysis and
- Conducting quantitative uncertainty analysis

### 6 6 1 Calculating and Characterizing Cancer Risk and Noncarcinogenic Effects

To quantify the human health risks the intakes are first calculated for each COC each applicable scenario and each AOC The CT and RME intakes are calculated based on measured or modeled concentrations and using the methodology documented in the RAGS (EPA 1989) and discussed in Section 6 4 Exposure Assessment, and Section 6 4 3 Calculated Intakes The specific intakes are then compared to the applicable chemical specific toxicological data discussed in Section 6 5 Toxicity Assessment, and presented in Table 6 41 to determine the potential CT and RME human health risks

The potential human health risks from each COC are calculated to determine potential carcinogenic effects and to determine potential noncarcinogenic effects Each of these calculations is discussed in the following sections

#### 6 6 1 1 Determining Carcinogenic Effects

The following calculations are used to determine carcinogenic effects by obtaining numerical estimates of lifetime cancer risks

$$RISK = INTAKE \times CSF$$

Where

Risk = Potential lifetime excess cancer risk (unitless)
CSF = Cancer slope factor for chemicals $(mg/kg\text{-}day)^{-1}$ or $(pCi)^{-1}$
Intake = Chemical intake (mg/kg-day) or (pCi)

Section 6 4 3 Calculated Intakes identifies where specific estimated intakes for each receptor by AOC are found and Table 6 31 presents the CSFs for each applicable COC Inhalation and ingestion CSFs were used with respective inhalation and ingestion intakes to estimate potential human health risks The CSF is characterized as an upperbound estimate

Cancer risks are summed separately across all potential nonradioactive and radioactive chemical carcinogens considered in the risk assessment using the following equation

$$RISK_T = \sum RISK_i$$

Where

$RISK_T$ = Total cancer risk expressed as a unitless probability
$RISK_i$ = Risk estimate for the ith contaminant

This equation is an approximation of the precise equation for combining risks to account for the probability of a receptor developing cancer as a consequence of exposure to two or more carcinogens As stated in RAGS (EPA 1989) the difference between the precise equation and this approximation is negligible for total cancer risks less than 0 1 This risk summation assumes independence of action by the compounds involved Some limitations are posed by this approach and are discussed in RAGS (EPA 1989)

Most models for low dose extrapolation produce quantitatively similar results in the range of observable data, but yield estimates that can vary by three or four orders of magnitude at lower doses Animal bioassay data are not adequate to determine whether any of the competing models are better than the others In addition there is no evidence to indicate that the precision of low-dose risk estimates increases through the use of more sophisticated models Thus if a carcinogenic response occurs at the exposure level studied it is assumed that a similar response will occur at all lower doses unless evidence to the contrary exists

Tables 6 87 through 6-96 document the risks calculated for AOC1 receptors using RME and CT exposure parameters Tables 6 97 through 6 106 document risks calculated for AOC2 receptors using RME and CT exposure parameters and Tables 6 107 through 6-110 document the risks calculated for AOC3 receptors using RME and CT parameters These tables identify the total calculated risk by receptor total receptor risk for each COC across all applicable pathways and total receptor risk for each pathway for all applicable COCs Point estimates of potential human health risk are discussed further in Section 6 6 2

### 6 6 1 2 Determining Noncarcinogenic Effects

Potential health effects associated with exposure to individual noncarcinogenic compounds are evaluated by calculating hazard quotients A hazard quotient (HQ) is the ratio of the intake rate to the RfD as follows

$$HQ = \frac{INTAKE}{RfD}$$

Where

HQ = Noncancer hazard quotient
Intake = Chemical intake (mg/kg day)
RfD = Reference dose (mg/kg day)

Chronic RfDs are extracted from IRIS and HEAST and specific values are documented on Table 6 31 Similar to CSFs the RfDs for inhalation and ingestion are used with respective inhalation and oral intakes

Hazard Indices (HIs) are the summed hazard quotients for each chemical across the applicable pathways When the HI exceeds unity there may be concern for potential human health effects from exposure to noncarcinogenic chemicals Obviously any single chemical with an exposure level greater than its toxicity value will cause the HI to exceed unity however multiple chemical exposures can also cause the HI to exceed this threshold even if no single chemical exposure exceeds its respective RfD

Tables 6 111 through 6 122 document the calculated RME and CT HQs and HIs for the applicable receptors in AOC1 Tables 6 123 through 6 134 document the calculated RME and CT HQs and HIs for the applicable receptors in AOC2 Tables 6-135 through 6 140 document the calculated RME and CT HQs and HIs for the applicable receptors in AOC3 The tables identify individual HQs by COC and pathway and provide total HIs by chemical and a total of all HIs by receptor The point estimates of potential health effects that are documented on these tables are discussed in more detail in Section 6 6 2

### 6 6 2 Point Estimates of Risk and Health Effects

Reasonable exposure pathways were evaluated in Section 6 3 Scenario and Pathway Identification and the risks and HI values for the applicable COCs were summed across these pathways Consistent with

EPA guıdance (EPA 1992b) both RME and CT poınt estımates for lıfetıme cancer rısk and potentıal noncarcınogenıc health effects were calculated Addıtıonally the total carcınogenıc rısks are documented separately for Class A B and C carcınogens as dırected by RAGS (EPA 1989) An addıtıonal poınt of reference ıs provıded by addıng the total rısks for the weıght of evıdence classıfıcatıons to arrıve at a conservatıve total rısk for each receptor These rısks are expressed ın the text usıng one sıgnıfıcant fıgure per EPA guıdance (EPA 1989) For greater detaıl the rısks estımated ın Tables 6 87 through 6 140 are expressed ın two sıgnıfıcant fıgures Noncarcınogenıc health effects are expressed as HI values Fırst the total HI values were calculated by summıng HQ values by receptor wıthout regard for the target organ affected Because no HI exceeded or approached unıty ıt was not necessary to sum the HQ values accordıng to target organ The followıng sectıons dıscuss the results of RME and CT poınt estımates of lıfetıme cancer rısk and potentıal noncarcınogenıc health effects by receptor

### 6 6 2 1 Future Construction Worker

The future constructıon worker ıs a potentıal receptor ın AOC1 and AOC2 As dıscussed ın Sectıon 6 3 Scenarıo and Pathway Identıfıcatıon the constructıon worker receptor ıs not an applıcable receptor ın AOC3 Total calculated RME rısk for thıs receptor ın AOC1 ıs 4E-07 wıth ıngestıon of surface soıl and exposure to external radıatıon beıng the drıvıng pathways and wıth uranıum 238 beıng the most sıgnıfıcant COC (Table 6 87) The constructıon worker total CT rısk ın AOC1 ıs 2E-07 the drıvıng pathway ıs external radıatıon and uranıum 238 ıs the most sıgnıfıcant COC (Table 6 92) The total calculated RME rısk for thıs receptor ın AOC2 ıs 8E 08 wıth ıngestıon of surface soıl contrıbutıng the most rısk and the most sıgnıfıcant COC beıng uranıum 238 (Table 6 97) The constructıon worker total CT rısk ın AOC 2 ıs 3E 08 wıth the external radıatıon pathway and uranıum 238 contrıbutıng the greatest rısk (Table 6 102)

Total RME HI calculated for the constructıon worker ın AOC1 ıs 0 04E 02 and the greatest pathway and COC respectıvely are ıngestıon of subsurface soıl and Aroclor 1254 (Table 6-111) The total CT HI calculated for thıs receptor ın AOC1 ıs 0 006 wıth the greatest contrıbutıon from ıngestıon of subsurface soıl and from Aroclor 1254 (Table 6 117) Total RME HI calculated for thıs receptor ın AOC2 ıs 0 01 wıth the greatest contrıbutıons comıng from ıngestıon of subsurface soıl and antımony (Table 6-123) Total CT HI calculated for the constructıon worker ın AOC2 ıs 0 002 wıth ıngestıon of subsurface soıl and antımony provıdıng the greatest rısk by pathway and COC respectıvely (Table 6 129)

### 6 6 2 2 Current Worker (Security Worker)

The current worker receptor is exposed to COCs in AOC1 and AOC2 and not in AOC3 Total RME risk for this receptor in AOC1 is 3E05 with the greatest contributors being the external radiation pathway and uranium 238 (Table 6 88) The total CT risk for the current worker at AOC1 is 2E 06 with a driving pathway of external radiation and uranium 238 contributing the most risk (Table 6 93) The total RME risk for this receptor in AOC2 is 4E 06 with the external radiation pathway and uranium 238 contributing the most risk (Table 6 98) The total CT risk for the current worker in AOC2 is 3E-07 with the greatest contributing pathway and COC of external radiation and uranium 238 respectively (Table 6 103)

The total RME HI for the current worker at AOC1 is 0 07E 02 with the driving pathway being dermal absorption of surface soil and the most significant COC being Aroclor 1254 in surface soil (Table 6 112) The total CT HI for this receptor at AOC1 is 0 01E 02 with dermal absorption the dominant pathway and Aroclor 1254 the dominant COC in soil (Table 6 118) The total RME HI for the current worker at AOC2 is 0 0005E 04 with the driving pathway being ingestion of surface soil and the most significant COC being copper (Table 6 124) The total CT HI for this receptor at AOC2 is 0 00008 the respective driving pathway and COC are ingestion of surface soil and copper respectively (Table 6 130)

### 6 6 2 3 Future Ecological Researcher

The future ecological researcher is an applicable receptor in all three AOCs The RME total risk for this receptor in AOC1 is 1E 06 The driving pathway is exposure to external radiation and the most significant COC is uranium 238 (Table 6 89) The CT total risk for a future ecological researcher in AOC1 is 7E-07 with the dominant pathway and COC being external radiation and uranium 238 respectively (Table 6-94) The RME total risk for this receptor in AOC2 is 2E 07 and the driving pathwav is exposure to external radiation and the most significant COC is uranium 238 (Table 6 99) The CT total risk for this receptor in AOC2 is 1E 07 the respective dominant pathway and COC is external radiation exposure and uranium 238 (Table 6 104) The RME total risk for an ecological researcher in AOC3 is 2E-08 with a driving pathway of ingestion of pond sediments and the most significant COC is plutonium 239/240 (Table 6 107) The CT total risk for this receptor in AOC3 is 6E 09 with the respective dominant pathway and COC being ingestion of pond sediments and plutonium 239/240 (Table 6 109)

The RME total HI for the ecological researcher in AOC1 is 0 04 the dominant pathway is dermal absorption of surface soil and the most significant COC is Aroclor 1254 in surface soil (Table 6 113) The CT total HI for this receptor in AOC1 is 0 01 the driving pathway is ingestion of seep sediments and the dominant COC is Aroclor 1254 (Table 6 119) Total RME HI for this receptor in AOC2 is 0 02 with the respective dominant pathway and COC being ingestion of seep sediments and antimony (Table 6 125) The CT total HI for an ecological researcher in AOC2 is 0 004 The driving pathway is ingestion of seep sediments and the dominant COC is antimony (Table 6 131) The RME HI total for this receptor in AOC3 is 0 004 with the driving pathway being ingestion of stream sediments and the driving COC is mercury (Table 6 135) The CT total HI for an ecological researcher in AOC3 is 0 001 The respective dominant pathway and COC is ingestion of stream sediments and mercury (Table 6 138)

### 6 6 2 4 Future Office Worker

The future office worker is a potential receptor in AOC1 and AOC2 only As discussed in Section 6 3 Scenario and Pathway Identification the office worker receptor is not an applicable receptor in AOC3 The total RME risk for this receptor in AOC1 is 3E 05 with the driving pathway being exposure to external radiation and the dominant COC being uranium 238 (Table 6-90) Total CT risk for a future office worker in AOC1 is 2E 06 the respective dominant pathway and COC are external radiation and uranium 238 (Table 6 95) The total RME risk for this receptor in AOC2 is 4E-06 the driving pathway is exposure to external radiation and the dominant COC is uranium 238 (Table 6 100) Total CT risk for this receptor in AOC2 is 3E 07 and the respective dominant pathway and COC are exposure to external radiation and uranium 238 (Table 6 105)

The RME total HI for the future office worker in AOC1 is 0 05 The driving pathway is dermal absorption of surface soil and the dominant COC is Aroclor 1254 in surface soil (Table 6 114) CT total HI for this receptor in AOC1 is 0 007 with the dominant pathway and COC respectively being dermal absorption of surface soil and Aroclor 1254 in surface soil (Table 6 120) The total RME HI for a future office worker in AOC2 is 0 0005 The driving pathway is ingestion of surface soil and the most significant COC is copper (Table 6 126) Total CT HI for this receptor in AOC2 is 0 00004 with the driving pathway and COC respectively of ingestion of surface soil and copper (Table 6 132)

### 6 6 2 5 Future Open-Space User

Future open space users consist of both adults and children with complete pathways in all three AOCs Total lifetime cancer risks are estimated for an open space user whereas noncancer hazard indices are calculated separately for adult and child receptors for the soil and sediment ingestion scenarios The total RME risk for the open space user in AOC1 is 4E-06 with respective dominant pathway and COC of exposure to external radiation and uranium 238 (Table 6 91) The total CT risk for this receptor is 4E 07 with a driving pathway of external radiation exposure and uranium 238 being the most significant COC (Table 6 96) Total RME risk for this open space receptor in AOC2 is 6E-07 The dominant pathway is exposure to external radiation and the dominant COC is uranium 238 (Table 6 101) Total CT risk for an open space user in AOC2 is 6E-08 with external radiation exposure being the dominant pathway and uranium 238 the most significant COC (Table 6 106) Total RME risk for this receptor in AOC3 is 4E 08 The dominant pathway and COC are ingestion of pond sediments and plutonium 239/240 respectively (Table 6 108) The CT total risk for this adult receptor is 2E 09 with the driving pathway being ingestion of pond sediments and the driving COC being plutonium 239/240 (Table 6 110)

The total RME HI for the open space user in AOC1 is 0 01 with a driving pathway of dermal absorption and the most significant COC being Aroclor 1254 in surface soil (Table 6 115) The total RME HI for a child open space receptor in AOC1 is 0 04 The dominant pathway and COC are ingestion of seep sediments and antimony respectively (Table 6 116) The total CT HI for the adult receptor in AOC1 is 0 0009 and the driving pathway and COC are ingestion of seep sediments and antimony respectively (Table 6 121) The total CT HI for a child open space receptor in AOC1 is 0 007 The dominant pathway is ingestion of seep sediments and the most significant COC is antimony (Table 6 122)

The total RME HI for an adult open space receptor in AOC2 is 0 003 with respective dominant pathway and COC being ingestion of seep sediments and antimony (Table 6 127) Total RME HI for this child receptor in AOC2 is 0 03 The driving pathway is ingestion of seep sediments and the most significant COC is antimony (Table 6 128) Total CT HI for an adult receptor in AOC2 is 0 0006 with the dominant pathway being ingestion of seep sediments and antimony being the dominant COC (Table 6 133) The CT total HI for a child open space receptor in AOC2 is 0 005 with the driving pathway of ingestion of seep sediments and the driving COC is antimony (Table 6 134)

The total RME HI for an adult open space user in AOC3 is 0 0008 with respective dominant pathway and COC being ingestion of stream sediments and mercury (Table 6 136) Total RME HI for a child open space receptor in AOC3 is 0 007 The dominant pathway is ingestion of stream sediments and the dominant COC is mercury (Table 6-137) Total CT HI for the adult open space receptor in AOC3 is 0 0002 The driving pathway is ingestion of stream sediments and the most significant COC is mercury (Table 6 139) The CT total HI for the child open space receptor in AOC3 is 0 0004 with respective dominant pathway and COC being ingestion of stream sediments and mercury (Table 6 140)

### 6 6 3 Uncertainty Analysis

Analysis of uncertainty associated with risk estimates is an important part of the risk assessment process EPA guidance (EPA 1992b) states that point estimates of risk do not fully convey the range of information considered and used in developing the assessment. The EPA has suggested the use of both RME and CT exposure scenarios in order to provide upper (conservative) and lower (less conservative) bounds on what the actual risk may be This is an alternative method of portraying the uncertainty inherent in the risk estimates to performing a more time consuming and expensive probablistic uncertainty analysis The RME estimates are to be used for risk management decisions but a comparison to the CT estimates provides a good estimation of the uncertainty associated with the decisions Quantitative probablistic uncertainty analysis was not performed in this risk assessment. The range between the RME and CT risk estimates is a good indicator of the uncertainty inherent in the RME characterization Uncertainties identified during the risk assessment process are discussed below

During the risk assessment process there are essentially four stages of the analysis that can introduce uncertainties These stages are data collection and evaluation exposure assessment, toxicity assessment, and risk characterization The uncertainties within the HHRA are driven by uncertainty in the site investigation data, the likelihood of hypothetical exposure scenarios the transport models used to estimate concentrations at receptor locations receptor intake parameters and the toxicity values used to characterize risk. Uncertainties are also introduced in the risk assessment when exposure to several substances across multiple pathways are summed

The following sections qualitatively discuss specific uncertainties introduced into the OU 5 HHRA Table 6 141 summarizes the uncertainties and limitations in this HHRA

### 6 6 3 1 POTENTIAL IMPACTS TO HHRA

As discussed in Section 2 2 impacts if any that result from the collection of additional data during the TM15 field investigation on the conclusions of the OU 5 HHRA must be assessed This section discusses an assessment of potential impacts to the HHRA

Tables 2 3 through 2 10 provide a summary of the results of the analyses of samples collected during the 15 field investigation and those collected during the investigation outlined in the OU 5 Work Plan (DOE 1992a) The information provided on these tables was discussed in Section 2 2 to assist in assessing whether the results of the TM15 field investigation impacted the conclusions of the HHRA As discussed in Chapters 4 0 and 6 0 the data collected under the OU 5 Work Plan investigation were aggregated bv each sample medium on an OU wide basis for comparison to background to identify PCOCs and subsequent COCs TM11 COCs for HHRA (DOE 1995a) details the background comparison and PCOC and COC determinations The purpose of this section is to compare the results of the sampling program for each environmental medium sampled under TM15 with the results of the OU 5 Work Plan investigation It should be recognized that many of the samples collected during the TM15 field investigation were collected for purposes other than for the HHRA (e g for characterization of drummed cuttings and fluids) This assessment of the potential for impact to the conclusions of the HHRA was performed to ensure that the results of the HHRA represent the most conservative estimates of risk to human health

*Subsurface Soils* Data for subsurface soil samples are provided in Tables 2 3 2 4 and 2 5 for metals radionuclides and organic compounds respectively As indicated on Table 2 3 the mean concentration of the combined OU 5 subsurface soil data set (includes samples collected prior to and during the implementation of TM15) for several metals increased significantly relative to the mean concentration calculated previously for the HHRA using only those data collected prior to the implementation of TM15 A significant increase in concentrations could result in a metal that was not previously identified as a COC in being identified as a COC using the larger data set. The apparent increased concentrations of cesium selenium thallium and tin can all be attributed to the increased reporting limits provided in RFEDS for the samples collected during the implementation of TM15 versus those reported for the pre TM15 samples Each of these metals was detected at relatively low frequencies therefore the increased reporting limits cause the mean to be skewed toward higher concentrations (for non-detect results one half the reporting limit replaces the result for the calculation of statistics) This represents an apparent, rather than a real increase in concentrations

The mean concentration of lead also increased significantly from that reported previously In addition the maximum concentration of lead detected in subsurface soils increased from 935 mg/kg in the pre TM15 data to 5 200 mg/kg in a sample collected from one of the TDEM anomalies in the IHSS 133 area (Table 2 3) The concentrations of lead detected in subsurface soil samples from IHSS 115 collected during the TM15 field investigation are all within the range of background concentrations As discussed in Section 6 6 3 2 the close association of high lead concentrations with waste material identified during drilling in the ash pits (IHSS 133) indicates that the detected lead is not mobile in the soil or readily available for human intake and lead is not considered a significant contributor to the human health risk associated with OU 5

As indicated on Table 2 4 the mean activities of radionuclides in subsurface soils did not change appreciably from those calculated previously using only the pre TM15 data. The most significant increases in both mean and maximum activities occurred only for the uranium isotopes Each of these isotopes was identified as a COC in the OU 5 HHRA therefore an increase in concentrations would not result in a change in the list of COCs for subsurface soils The mean and maximum concentrations for these isotopes are the same magnitude as those used for the HHRA therefore the risk calculations would not change significantly

The following organic chemicals were detected in higher concentrations in subsurface soil samples collected during the implementation of TM15 than in subsurface soil samples collected prior to TM15 (Table 2 5) bis(2 ethylhexyl)phthalate bromoform, butylbenzyl phthalate cholorform, diethyl phthalate di n octyl phthalate and methylene chloride Of these compounds only bis(2 ethylhexyl)phthalate and methylene chloride were evaluated in the concentration/toxicity screening for the OU 5 HHRA (DOE 1995a) Butyl benzyl phthalate was evaluated by comparison to a risk based concentration (RBC) in DOE (1995a) None of these compounds were determined to be COCs for OU 5 in DOE (1995a)

In order to evaluate whether the concentrations of these organic chemicals detected in samples collected under the TM15 field investigation would impact the conclusions of the HHRA a comparison of the maximum concentration (both detects and nondetects) with the respective RBC was performed (Table 2 14) Although this comparison is usually performed only for those compounds that are detected at a frequency of less than 5 percent it is used here for all of these compounds regardless of detection frequency as an initial indicator of whether the results of the HHRA may need to be reevaluated

As indicated on Table 2 14 the maximum detected and nondetected concentrations for each of these organic chemicals in subsurface soils are significantly less than their respective RBC In addition for bis(2 ethylhexyl)phthalate and methylene chloride the percentage of total risk that would be associated with these chemicals at the maximum detected concentrations shown on Table 2 5 was recalculated for comparison to the concentration/toxicity screens presented in TM11 COCs for the HHRA (DOE 1995a) Even with the increased concentrations both chemicals still represent zero percent of the total risk factor noncarcinogenic and carcinogenic associated with subsurface soils

In summary the subsurface soil data collected during the TM15 field investigation do not indicate that the conclusions of the OU 5 TM11 COCs for the HHRA (DOE 1995a) need to be reevaluated to incorporate these data.

Groundwater. Tables 2 7 through 2 10 present summaries of data for groundwater samples collected during both the original OU 5 Work Plan investigation and during the TM15 field program The following discussions only include data from unfiltered samples (i e total results) for metals and radionuclides because only total concentrations are used in the HHRA

As shown on Table 2 7 the mean concentrations of most metals in the combined OU 5 data set decreased from those calculated for the HHRA using only the data collected under the OU 5 Work Plan investigation For those metals that were previously identified as being COCs this decrease in concentrations could potentially result in one or more of these constituents no longer being identified as a COC However inspection of the data provided on Table 2 7 indicates that, although the mean concentrations for these metals decreased the concentrations are still greater than the range of background concentrations Additionally for all of these metals the highest concentration detected was in samples collected during the original OU 5 Work Plan investigation Because the concentration/toxicity screens performed to determine COCs for the HHRA use the maximum concentration for each constituent the inclusion of the additional data would not affect the identification of COCs

The mean concentrations of arsenic and thallium in the combined data set are slightly higher than those calculated for samples collected during the OU 5 Work Plan investigation As discussed above for subsurface soils an increase in concentrations has the potential to result in a constituent that was not identified as a COC previously in being identified as a COC using the larger data set. Although the mean concentration for arsenic increased arsenic concentrations in the samples collected during the TM15 investigation are within the range of concentrations reported from the previous sampling program Additionally the increased mean calculated for thallium is the result of the low frequency of detection and the increased reporting limit for this constituent.

As discussed above for total metals in groundwater the mean total activities of most radionuclides in the combined data set also decreased from those calculated using only samples collected during the OU 5 Work Plan investigation (Table 2 9) In all cases the mean activities of those radionuclides identified as COCs decreased slightly and the highest activities reported for OU 5 samples were from samples collected during the OU 5 Work Plan investigation Therefore it is unlikely that the slight decrease in mean activities would result in these radionuclides not being identified as PCOCs and subsequently as COCs using the larger data set

The mean activities for two radionuclides cesium 137 and tritium calculated using the combined data set increased from those calculated using only the data collected under the OU 5 Work Plan investigation Although the mean activities for these radionuclides increased the activities detected in both the OU 5 Work Plan investigation data and the TM15 data are well within the range of background concentrations

The data presented in Table 2 10 indicate that a large number of organic compounds were detected in samples collected during the TM15 field investigation that were either not detected or were detected at lower concentrations in samples from the OU 5 Work Plan investigation These compounds are identified in Table 2 15 with a comparison of the maximum detected and nondetected concentrations with the appropriate RBC The maximum detected and nondetected concentrations of most of these compounds do not exceed the residential groundwater RBC For those compounds where the maximum detected and/or nondetected concentrations exceed the RBC none of the concentrations exceed 1 000 times the RBC

Therefore according to the criterion used in the OU 5 TM11 COCs for the HHRA (DOE 1995a) these compounds would not be considered special case COCs

Three of the organic compounds included in Table 2 15 were evaluated in the concentration/toxicity screens for OU 5 (DOE 1995a) These compounds bis(2 ethylhexyl)phthalate di n butyl phthalate and naphthalene were not identified as COCs based on the data collected under the OU 5 Work Plan investigation The percentage of total risk that would be associated with these chemicals using the maximum detected concentrations shown on Table 2 10 was recalculated for comparison to the concentration/toxicity screens presented in TM11 OU 5 COCs for the HHRA (DOE 1995a) With the higher concentrations the percentage of total noncarcinogenic risk attributable to these compounds did not change from that reported in (DOE 1995a) The percentage of the total carcinogenic risk attributable to bis(2 ethylhexyl)phthalate increased from 0 03 percent to 0 07 percent Therefore even at the higher concentrations none of these compounds would be identified as COCs

In summary the groundwater data collected during the TM15 field investigation do not indicate that the conclusions of the OU 5 HHRA as presented in TM11 (DOE 1995a) need to be reevaluated to incorporate these data

*Surface Soils* The activities of americium 241 and plutonium 239/240 detected in the surface soil samples collected from IHSS 209 and the other surface disturbances during the TM15 field investigation were less than the maximum activities reported previously for surface soil samples from OU 5 The concentration/toxicity screens performed to identify COCs for the OU 5 HHRA were calculated using the highest activity reported for the samples collected under the OU 5 Work Plan investigation Because these concentration/toxicity screens did not identify americium 241 and plutonium 239/240 as COCs at that time (DOE 1995a) the inclusion of additional data with lower activities would not change this determination Therefore the surface soil data collected during the TM15 field investigation does not impact the conclusions of the HHRA presented in this chapter

#### 6 6 3 2 Source Areas and Areas of Concern

In the Surface Disturbance South of the Ash Pits soil was the only medium in which PCOCs were detected These PCOCs consisted of two organic compounds and 26 inorganic compounds 5 of which were radionuclides The carcinogenic and noncarcinogenic ratio sums for this source area were calculated to be 0 82 and 0 45 respectively (DOE 1994) Because the ratio sums do not exceed one this source area was not considered an AOC and was not evaluated further

Similarly in the Surface Disturbance West of IHSS 209 PCOCs were detected only in soil The detected PCOCs consisted of three organic compounds and 25 inorganic compounds 5 of which were radionuclides The carcinogenic and noncarcinogenic ratio sums for this source area were calculated to be 2 2 and 0 42 respectively The carcinogenic ratio sum exceeds one because a single sample of plutonium 239/240 was greater than its RBC No other detected PCOC approached its respective RBC A review of the data indicated that the maximum activity of plutonium 239/240 was 5 01 pCi/g and the RBC is 3 43 pCi/g Subsequent sampling has not produced samples at this level of plutonium 239/240 activity and in fact has yielded results lower than the RBC of 3 43 pCi As a result it was determined that this source area does not contribute significantly to the risk associated with OU 5 and was not quantitatively evaluated as an AOC

### 6 6 3 3 Discussion of Analytes

Nickel was detected in OU 5 soil however it was considered inappropriate to apply a CSF The only forms of nickel known to be carcinogenic are nickel refinery dust and nickel subsulfide via the inhalation route (EPA 1994b) Based on historical evidence the only indication of nickel use at the Site is in the form of nickel carbonyl The limited toxicity information on nickel carbonyl indicates that it is a probable human carcinogen however there is inadequate data for human carcinogenicity Therefore no toxicity values (RfD/RfC or CSFs) are available for this form of nickel Nickel carbonyl is also highly volatile at room temperature and readily decomposes in the presence of oxygen Because of its physical properties and the fate and transport characteristics of nickel carbonyl it is unlikely that any of this compound remains onsite after 20 years Therefore based on the research performed on this issue nickel was not considered a significant contributor to OU 5 risk and was not evaluated as a carcinogenic chemical

Lead was detected in surface soil subsurface soil and groundwater at OU 5 The maximum lead concentration was 129 mg/kg in surface soil 935 mg/kg in subsurface soil and 240 $\mu$g/L in groundwater The levels of lead detected in surface soil and groundwater are well below the EPA screening level for lead in soil for residential land use of 400 ppm (EPA 1994e) The highest concentration of lead detected in subsurface soil was 935 mg/kg however all of the highest concentrations were detected in samples taken from the boreholes drilled within the ash pits (IHSS 133 1 to IHSS 133 4) In all cases the samples with the highest concentrations were collected from intervals where waste materials were encountered during drilling This indicates that the detected lead is not mobile in the soil or readily available for human intake Based on the sampling data lead is not considered a significant contributor to the human health risk associated with OU 5

Arsenic was identified as a PCOC in groundwater pond sediment and stream sediment However process knowledge does not indicate that there was any large quantity or widespread use of arsenic at the Site An agency meeting was held on February 16 1995 specifically to discuss the background comparisons and application of professional judgement as applied to arsenic (DOE 1995b) As discussed and agreed to in that meeting arsenic can be screened out as a PCOC for these three media based on the results of the statistical tests and professional judgement Arsenic is considered to be within background concentrations and will not significantly contribute to the risk at OU 5

Seven PAHs were identified as COCs in either surface or subsurface soil The CSM identified several potential receptors that have a complete dermal pathway to these media however RAGS (EPA 1989) states It is inappropriate to use the oral slope factor to evaluate the risks associated with dermal exposure to carcinogens such as benzo(a)pyrene which cause skin cancer through a direct action at the point of application The PAHs that are COCs in OU 5 are benzo(a)anthracene benzo(a)pyrene benzo(b)fluoranthene dibenzo(a,h)anthracene fluoranthene Indeno(1 2 3 cd)pyrene and pyrene Dermal exposure to these PAHs has not been quantified however it does not appear that these chemicals contribute significantly to the overall risks to the receptors that would potentially have dermal contact with surface and subsurface soil

## 6 7 RADIATION DOSE CALCULATIONS

Total radiation doses for one year of exposure (expressed as total Effective Dose Equivalent [EDE] in mrem/year) were estimated for receptors exposed to radionuclides in soil air and other media by ingestion inhalation and external irradiation pathways The estimated doses are compared to DOE radiation standards for protection of public health also expressed in mrem/yr

### 6 7 1 Methodology

This section defines the terms used in estimating annual radiation doses explains how the doses are calculated and describes the national annual radiation protection standards that are used for comparison to the calculated doses

#### 6 7 1 1 Definitions

Dose Terms

Absorbed Dose is the energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material The absorbed dose is expressed in units of rad (or gray) (1 rad = 0 01 gray )

Committed Dose Equivalent is the predicted total dose equivalent to a tissue or organ over a 50-year period after a known intake of radionuclide into the body It does not include contributions from external dose Committed dose equivalent is expressed in units of rem (or sievert)

Committed Effective Dose Equivalent (CEDE) is the sum of the committed dose equivalents to various tissues in the body each multiplied by the appropriate weighting factor Committed effective dose equivalent is expressed in units of rem (or sievert)

Dose Equivalent is the product of absorbed dose in rad (or gray) in tissue and a quality factor Dose equivalent is expressed in units or rem (or sievert)

Effective Dose Equivalent (EDE) is the summation of the products of the dose equivalent received by specified tissues of the body and a tissue specific weighting factor This sum is a risk-equivalent value and can be used to estimate the health effects risk of the exposed individual The tissue specific weighting factor represents the fraction of the total health risk resulting from uniform whole body irradiation that would be contributed by the particular tissue The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides and the effective dose equivalent due to penetrating radiation from sources external to the body Effective dose equivalent is expressed in units or rem (or sievert)

Weighting Factor is tissue specific and represents the fraction of the total health risk resulting from uniform whole body irradiation that could be contributed to that particular tissue The weighting factors recommended by the ICRP (Publication 26) and used here are

| Organ or Tissue | Weighting Factor |
|---|---|
| Gonads | 0 25 |
| Breasts | 0 15 |
| Red Bone Marrow | 0 12 |
| Lungs | 0 12 |
| Thyroid | 0 03 |
| Bone Surfaces | 0 03 |
| Remainder[1] | 0 30 |

[1] Remainder means the five other organs with the highest dose (e g liver kidney spleen, thymus adrenal pancreas stomach small intestine or upper and lower large intestine but excluding skin lens of the eye and extremities) The weighting factor for each of these organs is 0 06

Quality Factor is the principal modifying factor used to calculate the dose equivalent from the absorbed dose For the purposes of the Order the following quality factors which are taken from DOE 5480 11 are to be used

| Radiation Type | Quality Factor |
|---|---|
| X rays gamma rays positrans and electrons (including tritium) | 1 |
| Neutrons <10 keV | 3 |
| Neutrons >10 keV Protons and single charged particles of unknown energy with rest mass > one atomic mass unit | 10 |
| Alpha Particles Multiple charges particles (and particles of unknown energy) | 20 |

* For neutrons of known energies the more detailed quality factors given in DOE 5480 11 may be used

Radioactivity means the property or characteristic of radioactive material to spontaneously disintegrate with the emission of energy in the form of radiation The unit of radioactivity is the curie (or becquerel)

### 6 7 2 Calculating Annual Radiation Doses

Annual radiation doses were determined by selecting dose conversion factors and calculating the radionuclide intake for each receptor and pathway The annual EDE was then calculated

#### 6 7 2 1 Selection of Dose Conversion Factors

Radionuclide specific dose conversion factors for the CEDE were used in the calculation of EDEs for the ingestion and inhalation routes of exposure Radionuclide specific dose conversion factors for the EDEs were used for the external irradiation route of exposure These values were obtained from EPA s Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation Submersion and Ingestion (EPA 1988d) for the inhalation and ingestion route of exposure and from the External Exposure to Radionuclides in Air Water and Soil (EPA 1993a)

For some radionuclides dose conversion factors (DCF) vary based on the chemical species (e g oxidation state or mineralized form) of the radionuclide Differences in DCFs for the ingestion route of exposure reflect differences in fractional uptake ($f_1$) of radionuclide species from the small intestine to blood Less soluble radionuclide forms have smaller DCFs than more soluble forms because the less soluble forms are absorbed to a lesser degree from the gastrointestinal tract into the bloodstream (EPA 1988d) Since the form of radionuclide is not known the most conservative (or greatest $f_1$) was used for the most conservative estimate of radionuclide intake via ingestion Table 6 144 lists the fractional uptakes and ingestion DCFs (in Sv/Bq) for each radionuclide of concern

DCFs for the inhalation route of exposure also vary based on the chemical species of the radionuclide The different DCFs reflect the difference in the rates that radionuclide species are cleared from the lungs Lung clearance rates are classified as days (D) weeks (W) or years (Y) In general less soluble forms of the radionuclide are cleared from the lungs more slowly than more soluble forms Once again the species of each radionuclide of concern is not known so the most conservative lung clearance class was used in order to determine radionuclide intake via inhalation Table 6 144 lists the most conservative lung clearance class and corresponding inhalation DCF (in Sv/Bq) for each radionuclide of concern A check was performed to ensure that the f value and the lung clearance class were compatible and that the combination gave the highest combined ingestion and inhalation CEDE

For the external irradiation route of exposure the DCF is the annual EDE received (mrem/yr) from exposure to radiation from each radionuclide present external to the body The radiation field is assumed to be equal to the radiation level at a distance of 1 meter (m) above the ground surface The DCFs for external radiation exposure from surface soil were taken from an EPA report (EPA 1993a) and are listed in terms of mrem/year per $\mu$Ci/gram in Table 6 144

### 6 7 2 2 Ingestion and Inhalation Routes of Exposure

For the inhalation and ingestion routes of exposure annual intake of radionuclides expressed in pCi/yr is first calculated using the following equation

$$Intake\ (pCi/year) = C \times IR \times EF$$

Where

C = Activity concentration at the exposure point (pCi/g pCi/L or pCi/$m^3$)
IR = Intake rate (mg/day L/day $m^3$/day)
EF = Exposure frequency (days/year)

Exposure factors used in calculating annual radionuclide intake for specific receptors and pathways are identical to the exposure factors used in the intake equations in Sections 6 4 2 1 through 6 4 2 6 The annual intake of each radionuclide in pCi/year is multiplied by the CEDE DCF (mrem/pCi or Sv/Bq) from Table 6 144 to estimate the CEDE for one year (mrem/year)

### 6 7 2 3 External Irradiation

For the external irradiation route of exposure a concentration in soil (pCi yr/gram) is calculated using the following equation

$$AC\ \left(\frac{pCi\text{-}yr}{gram}\right) = C \times ED \times EF_r \times (1 - Se) \times Te$$

Where

| | |
|---|---|
| C | = Mass activity concentration at the exposure point (pCi/g soil) |
| ED | = Exposure Duration (1 year) |
| EF | = Exposure frequency ratio (unitless) |
| Se | = Gamma shielding factor (unitless) |
| Te | = Gamma exposure factor (unitless) |

The concentration of each radionuclide in soil (in pCi year/gram) is multiplied by the dose conversion factor for external radiation (mrem/year per pCi/gram) (Table 6 144) to estimate the annual EDE (mrem) for each radionuclide

#### 6 7 2 4 Estimating Annual Radiation Dose

The sum of CEDEs from all radionuclides taken into the body in a year added to the EDEs for all radionuclides external to the body is compared to radiation protection standards which also reflect this sum

Annual radiation doses were estimated for all receptors and exposure areas The results are summarized (Tables 6 145 through 6 146) and compared to radiation protection standards in the following sections

### 6 7 3 Radiation Protection Standards

DOE Order 5480 11 Radiation Protection for Occupational Workers limits radiation exposure of radiological workers to 50 mSv/year (5 000 mrem/yr) DOE order 5400 5 Radiation Protection of the Public and the Environment, limits the annual radiation dose limit for members of the public to 1 mSv/year (100 mrem/year) for all routes of exposure The occupational limit for general employees (i e those not considered to be radiological workers) may be 100 mrem/year to 5 000 mrem/year depending on employment circumstances However general employees who have not completed Radiological Worker I or II Training are not permitted unescorted access to any area in which they are expected to receive doses in excess of 100 mrem in one year General employees who have not received Radiological Worker I or II Training are not normally expected to exceed 100 mrem in a year These values are for radiation doses received in addition to that from natural background radiation (U S average background radiation is approximately 300 mrem/year NCRP 1987) and that received from routine medical treatments (U S average is approximately 50 mrem/year NCRP 1987) Background levels in the Denver area are estimated to range from 350 to 700 mrem/year these levels are higher than the national average because of high levels of radium thorium, and radon in native rock and soils and because cosmic radiation exposure increases with increased altitude (NCRP 1987)

### 6 7 4 Point Estimates of Annual Radiation Dose

Annual radiation doses in terms of mrem/year were calculated for onsite receptors in AOC1 AOC2 and AOC3 Results are summarized in Tables 6 145 through 6 147

#### 6 7 4 1 Future Construction Worker

Radionuclide exposure pathways evaluated for the current worker were

- Ingestion of surface soil
- Ingestion of subsurface soil
- Inhalation of airborne particle
- External irradiation from subsurface soil

The future construction worker is a potential receptor in AOC1 and AOC2 As discussed in Section 6 6 2 1 the construction worker receptor is not a receptor in AOC3 The total annual radiation dose for the construction worker in AOC1 is 7 1E-02 mrem/year for the CT exposure condition and 3 6E-01 mrem/year for the reasonable maximum exposure (RME) conditions (Table 6-145) The total annual radiation dose for the construction worker in AOC2 is 3 1E 02 mrem/year for the average (CT) exposure condition and 1 3E-01 mrem/year for the RME condition (Table 6 146) These values are below the DOE limits for radiological workers (5 000 mrem/year) and members of the public (100 rem/year)

#### 6 7 4 2 Current Worker (Security Worker)

Radionuclide exposure pathways evaluated for the current worker were

- Ingestion of surface soil
- Inhalation of airborne particles
- External irradiation from surface soil

The future construction worker is a potential receptor in AOC1 and AOC2 and not in AOC3 The total annual dose for the current worker in AOC1 is 1 8E 01 mrem/year for the CT exposure conditions and 5 4E 01 mrem/year for the RME conditions (Table 6 145) The total annual radiation dose for the current worker in AOC2 is 3 2E 02 mrem/year for the average (CT) exposure condition and 9 9E-02 mrem/year for the RME condition (Table 6 146) These values are below the DOE limits for radiological workers (5 000 mrem/year) and members of the public (100 rem/year)

### 6 7 4 3 Future Ecological Researcher

The future ecological researcher is an applicable pathway for all AOCs However AOC3 pathway varied from AOC1 and AOC2 pathways due to the unique nature of AOC3

Radionuclide exposure pathways evaluated for the ecological researcher in AOC1 and AOC2 were

- Ingestion of surface soil
- Inhalation of airborne particles
- Ingestion of seep sediments
- External irradiation from surface soil

Radionuclide exposure pathways for the ecological researcher in AOC3 were

- Ingestion of pond sediments
- Ingestion of stream sediments
- Ingestion of surface water

The total annual dose for the future ecological researcher in AOC1 is 1 9E-01 mrem/year for the CT exposure conditions and 2 6E-01 mrem/year for the RME conditions (Table 6 145) The total annual radiation dose for the ecological researcher in AOC2 is 6 2E 02 mrem/year for the average (CT) exposure condition and 5 9E 02 mrem/year for the RME condition (Table 6 146) The total annual dose for AOC3 was estimated as 4 1E 02 mrem/yr for the CT conditions and 1 3E 01 mrem/year for the RME conditions These values are below the DOE limits for radiological workers (5 000 mrem/year) and members of the public (100 rem/year)

### 6 7 4 4 Future Office Worker

The future office worker is a potential receptor in only AOC1 and AOC2 The office worker is not an applicable receptor in AOC3 Radionuclide exposure pathways for the office worker were the same as for the current worker The total annual dose for the office worker in AOC1 is 1 6E-01 mrem/year for the CT exposure conditions and 3 2E-01 mrem/year for the RME conditions (Table 6 145) The total annual dose for the future office worker in AOC2 is 2 5E 02 mrem/year for the average (CT) conditions and 9 9E-02 for the RME conditions (Table 6 146) These values are below the DOE limits for radiological workers (5 000 mrem/year) and members of the public (100 rem/year)

### 6 7 4 5 Future Open Space User

Radionuclide exposure pathways for the adult recreational user were the same as for the ecological worker The total annual dose for the adult receptor in AOC1 is 1 7E-02 mrem/year for the CT exposure conditions and 6 0E 02 mrem/year for the RME conditions (Table 6 145) Annual doses for the adult user in AOC2 is 3 3E 03 mrem/year for CT exposure conditions and 1 3E 02 mrem/yr for RME condition (Table 6 146) The radionuclide exposure pathways for AOC3 were the same as the AOC3 exposure pathways for the future ecological researcher The total annual dose for the adult recreational user in AOC3 is 4 8E 03 mrem/year for CT conditions and 2 5E 02 mrem/yr for RME exposure conditions (Table 6-147) These values are below the DOE limits for radiological workers (5 000 mrem/year) and members of the public (100 rem/year)

Radionuclide exposure pathways for the child open space user in AOC1 and AOC2 were

Ingestion of surface soil
Ingestion of seep sediments

The total annual dose for the child receptor in AOC1 is 6 2E-03 mrem/yr for CT conditions and 6 2E 02 mrem/year for RME exposure conditions (Table 6 145) The total annual dose for the child open space user in AOC2 is 1 7E-03 mrem/year for CT exposure conditions and 5 8E-02 mrem/year for RME conditions The radionuclide exposure pathways for the child receptor in AOC3 were the same as those for the adult open space user The total annual dose for the child open space user in AOC3 is 9 6E 03 mrem/year for CT conditions and 4 8E 02 mrem/year for RME exposure conditions (Table 6 147)

### 6 7 5 Summary of Results

Annual radiation dose calculations were performed for six onsite receptors in AOC1 and AOC2 Annual radiation dose calculations were performed for 3 onsite receptors (ecological researcher adult and child open space users) in AOC3 Dose conversion factors for radionuclide ingestion inhalation and external irradiation are listed in Table 6 144 Results are provided in Tables 6 145 through 6 147

Exposure pathways evaluated were soil/sediment ingestion inhalation of particles from soil ingestion of surface water (AOC3 only) and external irradiation from surface soil Additional pathways evaluated for the future ecological researcher and future open space user (adult and child) in AOC3 were ingestion of pond sediments and ingestion of stream sediments

Total annual radiation doses for all receptors in all AOCs were less than 1 which falls below the DOE limit of 100 mrem/yr for members of the public and indicates that exposure to radionuclides in OU 5 is negligible

## 6 8 RISK ASSESSMENT SUMMARY

The results of the risk and health effect calculations for all applicable receptors and pathways are summarized in Tables 6 142 and 6 143 The greatest total estimated risk was for the current worker in AOC1 and is 3E 05 The driving pathway is exposure to external radiation and the dominant COC is uranium 238 The greatest total estimated noncarcinogenic health effect was for the current worker in AOC1 and is calculated to be 7E-02 The driving pathway is dermal absorption of surface soil and the dominant COC is Aroclor 1254 in surface soil

Although the highest calculated risk is still within the National Oil and Hazardous Substances Pollution Contingency Plan (NAP) target risk range of 1E 06 to 1E 04 some additional receptors and locations are mentioned here for comparison The total RME estimated risk for a future office worker in AOC1 was calculated to be 3E 05 and the current worker in AOC2 was estimated to be 4E 06 The estimated RME risk for a future open space user in AOC1 is 4E-06 a future office worker in AOC2 is 4E-06 and an ecological researcher in AOC1 is 1E 06 All other receptors and respective pathways had total RME risks estimated to be less than 1E 06 Respective total CT estimated risks for the current worker at AOC1 and the future office worker at AOC1 were both calculated to be 2E 06 No other CT risk estimates exceeded 1E 06

Because RME total risk and RME HI estimates did not exceed 1E 04 and unity respectively a quantitative uncertainty analysis was not completed Qualitative discussions of uncertainty are contained in Section 6 6 3 and a summary of the uncertainties and limitations is contained in Table 6 141 Uncertainties in this risk assessment are due to uncertainties in the risk assessment process in general specific uncertainties in characterizing the site and the uncertainties and limitations specific to this assessment In general health protective assumptions were used such that the magnitude of human health risks are expected to be less than those calculated even with errors due to uncertainty in the approach This process bounds the plausible upper limits of risk and facilitates an informed risk management decision Information regarding the uncertainty in quantifying intakes toxicological and carcinogenic response credibility of future exposure scenarios and the magnitude of background risks will be used by the risk manager for regulatory decision making

**Table 6 1**

**Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Surface Soil**

| PCOC | Maximum Concentration (mg/kg) | RfD (mg/kg day) (a) | Type of RfD (b) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcin gens | | | | | | | |
| Acenaphthene | 4 40E+01 | 6 00E 02 | o | 7 33E+02 | 3 09E-03 | 0 31% | No |
| Anthracene | 4 70E+01 | 3 00E-01 | o | 1 57E+02 | 6 60E-04 | 0 07% | No |
| Aroclor 1254 | 3 90E+00 | 2 00E-05 | o | 1 95E+05 | 8 21E-01 | 82 12% | Y s |
| B nzo(g,h,i)perylene | 6 90E+00 | n/a | | | | | N( |
| Benzoic acid | 7 70E-01 | 4 00E+00 | o | 1 93E-01 | 8 11E 07 | 0 00% | No |
| Bis(2 ethylhexyl)phthalate | 2 00E-01 | 2 00E-02 | o | 1 00E+01 | 4 21E 05 | 0 00% | No |
| Cobalt | 1 37E+01 | 6 00E-02 | o | 2 28E+02 | 9 62E 04 | 0 10% | N |
| C pper | 1 84E+02 | 4 00E-02 | | 4 60E+03 | 1 94E-02 | 1 94% | Y s |
| Di n butylphthalate | 4 25E-01 | 1 00E-01 | o | 4 25E+00 | 1 79E-05 | 0 00% | No |
| Dib nzofuran | 2 00E+01 | n/a | | | | | No |
| Fluoranthene | 1 40E+02 | 4 00E-02 | o | 3 50E+03 | 1 47E 02 | 1 47% | Y |
| Fl i ien | 3 90E+01 | 4 00E 02 | o | 9 75E+02 | 4 11E 03 | 0 41% | No |
| L d | 1 29E+02 | n/a | | | | | N |
| M i ury | 6 60E 01 | 8 57E-05 | i | 7 70E+03 | 3 24E 02 | 3 24% | Yes |
| 2 M thyln phthal n | 1 20E+01 | n/a | | | | | N) |
| N th l n | 4 10E+01 | 4 00E-02 | | 1 03E+03 | 4 32E-03 | 0 43% | No |
| I h n nthr n | 1 70E+02 | n/a | | | | | N( |
| I yi n | 1 20E+02 | 3 00E 02 | | 4 00E+03 | 1 68E 02 | 1 68% | Y |
| Silv r | 9 43E+01 | 5 00E 03 | o | 1 89E+04 | 7 94E-02 | 7 94% | Y s |
| Zinc | 1 99E+02 | 3 00E-01 | o | 6 63E+02 | 2 79E-03 | 0 28% | No |
| | | Total Risk Factor (Rj) | = | 2 37E+05 | T tal % = | 100% | |

Notes

(a) The most restrictive of the oral or inhalation reference dose is used.

(b) o = oral i = inhalation

(n/a) Applicable toxicological criteria is not available

Table 6-2

Rocky Flats OU 5 Concentration/Toxicity Screen of Carcinogens in Surface Soil

| PCOC | Maximum Concentration (mg/kg) | Slope Factor (mg/kg-day) [a] | Type of Slope Factor [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Carcinogens | | | | | | | |
| Aroclor 1254 | 3 90E+00 | 7 70E+00 | o | 3 00E+01 | 6 33E 02 | 6 33% | Y s |
| B nzo( ) nthra ne | 4 50E+01 | 7 30E 01 | | 3 29E+01 | ( 92E 02 | ( )2% | Y |
| Benzo(a)pyrene | 4 10E+01 | 7 30E+00 | o | 2 99E+02 | 6 31E-01 | 63 07% | Y s |
| Benzo(b)fluoranthene | 4 90E+01 | 7 30E-01 | o | 3 58E+01 | 7 54E 02 | 7 54% | Yes |
| Benzo(k)fluoranthene | 2 50E+01 | 7 30E-02 | o | 1 83E+00 | 3 85E-03 | 0 38% | No |
| Bis(2-ethylhexyl)phthalate | 2.00E-01 | 1 40E-02 | o | 2 80E-03 | 5 90E 06 | 0 00% | N |
| Chrysene | 4 60E+01 | 7 30E-03 | o | 3 36E 01 | 7 08E 04 | 0 07% | N ) |
| Dibenzo(a,h)anthracene | 7 00E+00 | 7 30E+00 | o | 5 11E+01 | 1 08E 01 | 10 77% | Yes |
| Indeno(1 2 3-cd)pyrene | 3 20E+01 | 7 30E-01 | o | 2 34E+01 | 4 92E 02 | 4 92% | Y s |
| | | Total Risk Factor (Rj) | = | 4 75E+02 | Total % | 100% | |

Notes

(a) The mo t restrictive of the oral or inhalation slope factor is used

(b) = oral

## Table 6-3
## Rocky Flats OU5 Concentration/Toxicity Screen of Radionuclides in Surface Soil

| PCOC | Maximum Concentration (pCi/g) | Slope Factor (risk/pCi) [a] | Type of Slope Factor [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | |
| Americium 241 | 8 00E-01 | 3 20E-08 | i | 2 56E-08 | 2 55E 05 | 0 00% | No |
| Plutonium 239/240 | 5 01E+00 | 3 80E-08 | i | 1 90E 07 | 1 90E-04 | 0 02% | No |
| Uranium 233/234 | 2 80E+03 | 2 70E-08 | i | 7 56E 05 | 7 53E-02 | 7 53% | Yes |
| Uranium 235 | 6 70E+02 | 2 50E-08 | i | 1 68E-05 | 1 67E 02 | 1 67% | Yes |
| Uranium 238 | 3 80E+04 | 2 40E-08 | i | 9 12E-04 | 9 08E 01 | 90 79% | Yes |
| | | Total Risk Factor (Rj) | = | 1 00E-03 | T tal % = | 100% | |

Notes

(a) The most conservative of the oral or inhalation slope fa tor is used
(b) i = inhalation

**Table 6 4**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Subsurface Soil**

| PCOC | Maximum Concentration (mg/kg) | RfD (mg/kg day) (1) | Type of RfD (a) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Acenaphthene | 3 10E+01 | 6 00E-02 | o | 5 17E+02 | 4 67E-04 | 0 05% | No |
| Acetone | 2 80E-01 | 1 00E-01 | o | 2 80E+00 | 2 53E 06 | 0 00% | No |
| Anthracene | 4 60E+01 | 3 00E-01 | o | 1 53E+02 | 1 39E-04 | 0 01% | No |
| Antimony | 1 49E+02 | 4 00E-04 | o | 3 73E+05 | 3 37E-01 | 33 69% | Yes |
| Aroclor 1254 | 9 60E-01 | 2 00E-05 | o | 4 80E+04 | 4 34E-02 | 4 34% | Yes |
| Barium | 6 83E-01 | 1 40E-04 | i | 4 88E+03 | 4 41E-03 | 0 44% | No |
| Benzo(g,h,i)perylene | 1 90E+01 | n/a | | | | | N |
| 2 Butanone | 6 90E-02 | 2 90E-01 | i | 2 38E 01 | 2 15E-07 | 0 00% | No |
| Benzoic acid | 9 74E-01 | 4 00E+00 | o | 2 44E-01 | 2 20E-07 | 0 00% | No |
| Beryllium | 1 31E+02 | 5 00E-03 | o | 2 62E+04 | 2 37E-02 | 2 37% | Yes |
| Bis(2 ethylh xyl)phthalate | 2 90E-01 | 2 00E-02 | o | 1 45E+01 | 1 31E 05 | 0 00% | No |
| Cadmium | 5 69E+01 | 5 00E-04 | o | 1 14E+05 | 1 03E-01 | 10 29% | Y |
| Chr mium | 8 31E+03 | 1 00E+00 | o | 8 31E+03 | 7 52E-03 | 0 75% | No |
| C b lt | 6 76E+01 | 6 00E 02 | o | 1 13E+03 | 1 02E 03 | 0 10% | No |
| C pp r | 6 92E+03 | 4 00E 02 | | 1 73E+05 | 1 56E-01 | 15 65% | Yes |
| Dib nz fur n | 2 00E+01 | n/a | | | | | N |
| Fl nth n | 1 60E+02 | 4 00E 02 | o | 4 00E+03 | 3 62E 03 | 0 36% | No |
| Flu r n | 3 50E+01 | 4 00E 02 | o | 8 75E+02 | 7 91E 04 | 0 08% | No |
| Lead | 9 35E+02 | n/a | | | | | No |
| Methylene chloride | 6 60E-02 | 6 00E-02 | o | 1 10E+00 | 9 95E-07 | 0 00% | No |
| 2-Methylnaphthalene | 1 50E+01 | n/a | | | | | No |
| Molybdenum | 1 90E+02 | 5 00E-03 | o | 3 80E+04 | 3 44E-02 | 3 44% | Y s |
| Naphthalene | 6 10E+01 | 4 00E-02 | o | 1 53E+03 | 1 38E-03 | 0 14% | No |
| Nickel | 4 75E+03 | 2 00E-02 | o | 2 38E+05 | 2 15E-01 | 21 48% | Yes |
| Phenanthrene | 2 20E+02 | n/a | | | | | No |
| Pyrene | 1 50E+02 | 3 00E-02 | o | 5 00E+03 | 4 52E-03 | 0 45% | No |
| Silver | 3 11E+02 | 5 00E-03 | o | 6 22E+04 | 5 63E-02 | 5 63% | Yes |
| Tetrachloroethene | 9 20E-01 | 1 00E-02 | o | 9 20E+01 | 8 32E-05 | 0 01% | No |
| Toluene | 3 10E-01 | 1 14E-01 | i | 2 72E+00 | 2 46E-06 | 0 00% | No |
| Zinc | 2 39E+03 | 3 00E-01 | o | 7 97E+03 | 7 21E-03 | 0 72% | No |
| | | Total Risk Factor (Rj) | = | 1 11E+06 | Total % = | 100% | |

N tes

(1) Th m t restri tive of th ral r inhalation ref rence dose is us d
(a) = oral i = inhalati n
(n/a) [illegible] h abl t xicologi al int ria is n t available

Table 6-5
Rocky Flats OU 5 Concentration/Toxicity Screen of Carcinogens in Subsurface Soil

| PCOC | Maximum Concentration (mg/kg) | Slope Factor (mg/kg-day) [a] | Type of Slope Factor [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Carcinogens | | | | | | | |
| Aroclor 1254 | 9 60E-01 | 7 70E+00 | o | 7 39E+00 | 3 95E-03 | 0 39% | N |
| Benzo(a)anthrac n | 4 80E+01 | 7 30E-01 | o | 3 50E+01 | 1 87E-02 | 1 87 ⁄ | Y |
| Benzo(a)pyrene | 4 30E+01 | 7 30E+00 | o | 3 14E+02 | 1 68E-01 | 16 76% | Yes |
| Benzo(b)fluoranthene | 4 80E+01 | 7 30E-01 | o | 3 50E+01 | 1 87E-02 | 1 87% | Yes |
| Benzo(k)fluoranthene | 1 90E+01 | 7 30E-02 | o | 1 39E+00 | 7 40E-04 | 0 07% | N ) |
| Beryllium | 1 31E+02 | 8 40E+00 | ı | 1 10E+03 | 5 87E-01 | 58 74% | Yc |
| Bis(2 ethylhexyl)phthalate | 2 90E-01 | 1 40E-02 | o | 4 06E-03 | 2 17E 06 | 0 00% | No |
| Cadmium | 5 69E+01 | 6 30E+00 | ı | 3 58E+02 | 1 91E 01 | 19 14% | Y s |
| Chrysene | 5 30E+01 | 7 30E-03 | o | 3 87E 01 | 2 07E 04 | 0 02% | N |
| Dibenzo(a,h)anthrac ne | 7 00E-01 | 7 30E+00 | o | 5 11E+00 | 2 73E-03 | 0 27% | N |
| Indeno(1,2,3 d)pyrene | 2 20E+01 | 7 30E-01 | o | 1 61E+01 | 8 57E-03 | 0 86% | N |
| Methyl ne chloride | 6 60E-02 | 7 50E 03 | o | 4 95E 04 | 2 64E-07 | 0 00% | N ) |
| T tra hl roeth n | 9 20E 01 | 5 20E 02 | o | 4 78E-02 | 2 55E-05 | 0 00% | No |
| Tri hl r eth n | 4 40E 01 | 1 10E 02 | | 4 84E 03 | 2 58E 06 | 0 00% | No |
| | | Total Risk Fa tor (Rj) | = | 1 87E+03 | Total % = | 100% | |

N t

( ) Th most restri tive of the ral or inhalation slope factor is used
(b) o = oral ı = inhalation

## Table 6-6
### Rocky Flats OU 5 Concentration/Toxicity Screen of Radionuclides in Subsurface Soil

| PCOC | Maximum Concentration (pCi/g) | Slope Factor (risk/pCi) [a] | Type of Slope Factor [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | |
| Americium 241 | 6 10E-01 | 3 20E-08 | i | 1 95E 08 | 6 04E 04 | 0 06% | No |
| Plutonium 239/240 | 3 20E+00 | 3 80E-08 | i | 1 22E 07 | 3 76E 03 | 0 38% | N( |
| Uranium 233/234 | 1 26E+02 | 2 70E-08 | i | 3 40E-06 | 1 05E-01 | 10 52% | Y s |
| Uranium 235 | 3 77E+01 | 2 50E-08 | i | 9 43E-07 | 2 92E 02 | 2 92% | Y s |
| Uranium 238 | 1 16E+03 | 2 40E-08 | i | 2 78E-05 | 8 61E 01 | 86 12% | Yes |
| | | Total Risk Factor (Rj) | = | 3 23E-05 | Total % = | 100% | |

Notes

(a) The most restrictive of the oral or inhalation slope factor is used
(b) i = inhalation

Table 6 7

Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Groundwater

| PCOC | Maximum Concentration (mg/L) [a] | RfD (mg/kg-day) [b] | Type of RfD | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Acenaphth ne | 5 00E-03 | 6 00E-02 | o | 8 33E 02 | 2 69E 05 | 0 00% | N |
| Aluminum | 3 57E+02 | 2 90E+00 | o | 1 23E+02 | 3 97E-02 | 3 97% | Yes |
| Barium | 3 04E+00 | 7 00E-02 | o | 4 34E+01 | 1 40E 02 | 1 40% | Yes |
| Beryllium | 2 94E-02 | 5 00E-03 | o | 5 88E+00 | 1 89E-03 | 0 19% | N |
| Bis(2 ethylhexyl)phthalate | 3 00E-03 | 2 00E-02 | o | 1 50E 01 | 4 83E 05 | 0 00% | No |
| Cadmium | 8 20E-03 | 5 00E-04 | o | 1 64E+01 | 5 29E-03 | 0 53% | No |
| Chromium | 4 42E-01 | 1 00E+00 | o | 4 42E 01 | 1 42E 04 | 0 01% | No |
| Cobalt | 1 61E-01 | 6 00E-02 | o | 2 68E+00 | 8 65E 04 | 0 09% | N |
| Copper | 4 20E-01 | 4 00E-02 | o | 1 05E+01 | 3 38E 03 | 0 34% | N |
| Di n butylphthalate | 2 00E-03 | 1 00E-01 | o | 2 00E 02 | 6 45E 06 | 0 00% | N |
| Di thylphthalate | 6 00E 03 | 8 00E 01 | o | 7 50E 03 | 2 42E 06 | 0 00% | No |
| Flu ranthene | 4 00E 03 | 4 00E 02 | o | 1 00E 01 | 3 22E 05 | 0 00% | N |
| Flu r ne | 4 00E-03 | 4 00E 02 | o | 1 00E 01 | 3 22E-05 | 0 00% | N |
| I ad | 2 40E 01 | n/a | | | | | No |
| Lithium | 3 06E 01 | 2 00E 02 | o | 1 53E+01 | 4 93E-03 | 0 49% | N |
| M n n | 1 37E+01 | 5 00E 03 | o | 2 74E+03 | 8 83E 01 | 88 30% | Y |
| M r y | 3 00E 03 | 3 00E 04 | ( | 1 00E+01 | 3 22E-03 | 0 32% | N |
| M lybd num | 1 80E-02 | 5 00E 03 | o | 3 60E+00 | 1 16E-03 | 0 12% | No |
| Naphthalene | 1 30E-02 | 4 00E-02 | o | 3 25E-01 | 1 05E-04 | 0 01% | No |
| Nickel | 3 13E-01 | 2 00E-02 | o | 1 57E+01 | 5 04E-03 | 0 50% | No |
| Ph nanthrene | 6 00E-03 | n/a | | | | | No |
| Pyrene | 6 50E-03 | 3 00E-02 | o | 2 17E-01 | 6 98E-05 | 0 01% | No |
| Silicon | 3 54E+02 | n/a | | | | | No |
| Silver | 5 32E-02 | 5 00E-03 | o | 1 06E+01 | 3 43E-03 | 0 34% | No |
| Strontium | 2 58E+00 | 6 00E-01 | o | 4 29E+00 | 1 38E-03 | 0 14% | No |
| Tin | 3.00E-01 | 6 00E-01 | o | 5 00E-01 | 1 61E-04 | 0 02% | No |
| Vanadium | 6 74E-01 | 7 00E-03 | o | 9 63E+01 | 3 10E-02 | 3 10% | Yes |
| Zinc | 9 82E-01 | 3 00E-01 | o | 3 27E+00 | 1 05E-03 | 0 11% | No |
| | | Total Risk Factor (Rj) | = | 3 10E+03 | T tal % = | 100% | |

Notes

(a) The more conservative total analyte maximum concentrations is us d

(b) Only oral ref rence doses are used for inorganic compounds

( ) r l

( / ) Appli abl t xi l gi al nt ria n t available

**Table 6-8**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Carcinogens in Groundwater**

| PCOC | Maximum Concentration (mg/L) [a] | Slope Factor (mg/kg-day) [b] | Type of Slope Factor [c] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Carcinogens | | | | | | | |
| Beryllium | 2 94E-02 | 4 30E+00 | o | 1 26E-01 | 1 00E+00 | 99 97% | Yes |
| Bis(2 ethylhexyl)phthalate | 3 00E-03 | 1 40E-02 | o | 4 20E 05 | 3 32E 04 | 0 03% | No |
| | | Total Risk Factor (Rj) | = | 1 26E-01 | T tal % | 100% | |

Notes
(a) The more conservative total analyte maximum concentrations is used
(b) Only oral slope factors are used.
(c) o = oral i = inhalation

**Table 6-9**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Radionuclides in Groundwater**

| PCOC | Maximum Concentration (pCi/L) (a) | Slope Factor (risk/pCi) (b) | Type of Slope Factor ( | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | |
| Americium 241 | 2 00E-01 | 2 40E 10 | o | 4 80E 11 | 1 89E 02 | 1 89% | Y s |
| Plutonium 238 | 1 00E-02 | 2 20E 10 | o | 2 20E 12 | 8 64E 04 | 0 09% | N |
| Plut nium 239/240 | 1 04E+00 | 2 30E 10 | | 2 3 F 10 | 9 40E 02 | J 40 % | Y |
| Radium 226 | 4 40E+00 | 1 20E-10 | | 5 28E 10 | 2 07E 01 | 20 74% | Y s |
| Uranium 233/234 | 4 90E+01 | 1 60E-11 | o | 7 84E-10 | 3 08E 01 | 30 80% | Y s |
| Uranium 235 | 4 00E+00 | 1 60E 11 | o | 6 40E 11 | 2 51E-02 | 2 51% | Yes |
| Uranium 238 | 4 40E+01 | 2 00E-11 | | 8 80E 10 | 3 46E 01 | 34 57% | Yes |
| | | Total Risk Factor (Rj) | = | 2 55E 09 | Total % = | 100% | |

Not s
(a) Th m nservativ tot l analyt maximum ncentrations i us d
(b) Only ral slope factors are us d
( ) - ral

## Table 6-10
## Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Surface Water

| PCOC | Maximum Concentration (mg/L) [a] | RfD (mg/kg day) [b] | Type of RfD [c] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Barium | 1 87E-01 | 7 00E 02 | o | 2 67E+00 | 6 25E-01 | 62 54% | Y s |
| Lithium | 1 38E-02 | 2 00E-02 | o | 6 90E 01 | 1 62E 01 | 16 15% | Yεs |
| Strontium | 5 46E-01 | 6 00E-01 | o | 9 10E 01 | 2 13E-01 | 21 30% | Yes |
| | | Total Risk Factor (Rj) | = | 4 27E+00 | Total % = | 100% | |

Notes
(a) The more conservative total analyte maximum concentrations is used
(b) The most restrictive of the oral or inhalation reference dose is used
(c) o = oral

**Table 6-11**

**Rocky Flats OU 5 Concentration/Toxicity Screen of Radionuclides in Surface Water**

| PCOC | Maximum Concentration (pCi/L) [a] | Slope Factor (risk/pCi) [b] | Type of Slope Factor [c] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | |
| Americium 241 | 3 80E-01 | 2 40E 10 | o | 9 12E-11 | 2 98E 01 | 29 81% | Y s |
| Uranium 233/234 | 4 67E+00 | 1 60E-11 | o | 7 47E 11 | 2 44E-01 | 24 42% | Y s |
| Uranium 238 | 7 00E+00 | 2 00E 11 | o | 1 40E 10 | 4 58E-01 | 45 76% | Y s |
| | | Total Risk Factor (Rj) | = | 3 06E 10 | Total % = | 100% | |

Notes

(a) The more conservative total analyte maximum concentrations is used

(b) The most restrictive of the oral or inhalation slope factor is used

(c) o = oral

**Table 6-12**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Seep Water**

| PCOC | Maximum Concentration (mg/L) [a] | RfD (mg/kg day) [b] | Type of RfD [c] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Acetone | 6 50E-02 | 1 00E 01 | o | 6 50E-01 | 1 50E 01 | 14 98% | Y s |
| 1,1 Di hl roethene | 4 00E-03 | 9 00E 03 | o | 4 44E 01 | 1 02E 01 | 10 24% | Y |
| 1,2 Dichloroethene | 4 00E-03 | 9 00E-03 | o | 4 44E-01 | 1 02E 01 | 10 24% | Yes |
| Tetrachloroethene | 2 80E-02 | 1 00E-02 | o | 2 80E+00 | 6 45E-01 | 64 53% | Yes |
| 1 1 1 Trichloroethane | 2 00E-03 | n/a | | | | | No |
| | | T tal Ri k F tor (Rj) | = | 4 34E+00 | T t l % = | 100% | |

Notes
Possibe laboratory contaminant
( ) The most restrictive of the oral or inhalation referen e d e is u d
(b) o = oral
(n/a) Applicable toxi ological criteria i not available

**Table 6-13**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Carcinogens in Seep Water**

| PCOC | Maximum Concentration (mg/L) | Slope Factor (mg/kg-day) (a) | Type of Slope Factor (b) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Carcinogens | | | | | | | |
| 1,1 Dichloroethene | 4 00E-03 | 1 20E+00 | i | 4 80E 03 | 7 58E-01 | 75 79% | Yes |
| Tetra hloroethene | 2 80E-02 | 5 20E-02 | o | 1 46E 03 | 2 30E-01 | 22 99% | Yes |
| Trichloroethene | 7 00E-03 | 1 10E-02 | o | 7 70E-05 | 1 22E-02 | 1 22% | Yes |
| | | Total Risk Factor (Rj) | = | 6 33E 03 | Total % = | 100% | |

Notes
(a) The most restrictive of the oral or inhalation slope factor is used
(b) o = oral i = inhalation

## Table 6-14
## Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Pond Sediment

| PCOC | Maximum Concentration (mg/kg) | RfD (mg/kg-day) (a) | Type of RfD (b) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Benzoic acid | 4 10E-01 | 4 00E+00 | o | 1 03E 01 | 5 30E 06 | 0 00% | No |
| Di n butylphthalate | 1 10E-01 | 1 00E-01 | o | 1 10E+00 | 5 68E 05 | 0 01% | No |
| Fluoranthene | 1 40E-01 | 4 00E 02 | o | 3 50E+00 | 1 81E 04 | 0 02% | No |
| Mercury | 1 60E+00 | 8 57E 05 | i | 1 87E+04 | 9 65E-01 | 96 49% | Yes |
| Phenol | 1 50E-01 | 6 00E-01 | o | 2 50E 01 | 1 29E-05 | 0 00% | No |
| Toluene | 5 63E-01 | 1 10E-01 | i | 5 11E+00 | 2 64E-04 | 0 03% | No |
| Zinc | 2.01E+02 | 3 00E 01 | o | 6 70E+02 | 3 46E 02 | 3 46% | Yes |
| | | Total Risk Factor (Rj) | = | 1 93E+04 | Total % = | 100% | |

N t s
( ) Th mo t r strictive of the oral or inhalation reference dose is us d
(b) o = oral i = inhalation
(n/a) Applicable t xi ol gi al crit ria is n t available

**Table 6-15**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Radionuclides in Pond Sediment**

| PCOC | Maximum Concentration (pCi/g) | Slope Factor (risk/pCi) [a] | Type of Slope Factor [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | |
| Americium 241 | 4 20E-01 | 3 20E-08 | i | 1 34E-08 | 4 89E-02 | 4 89% | Y s |
| Plutonium 239/240 | 2 40E+00 | 3 80E-08 | i | 9 12E-08 | 3 32E-01 | 33 21% | Yes |
| Uranium 233/234 | 3 50E+00 | 2 70E-08 | i | 9 45E-08 | 3 44E 01 | 34 41% | Yes |
| Uranium 235 | 1 40E-01 | 2 50E-08 | i | 3 50E-09 | 1 27E-02 | 1 27% | Yes |
| Uranium-238 | 3 00E+00 | 2 40E-08 | i | 7 20E-08 | 2 62E 01 | 26 22% | Yes |
| | | Total Risk Factor (Rj) | = | 2 75E 07 | Total % = | 100% | |

Notes
(a) The most restrictive f the oral or inhalation slope factor is used
(b) i = inhalation

**Table 6 16**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Seep Sediment**

| PCOC | Maximum Concentration (mg/kg) | RfD (mg/kg day) (1) | Type of RfD (a) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Acetone | 1 70E-02 | 1 00E-01 | o | 1 70E-01 | 1 27E-06 | 0 00% | No |
| Antimony | 5 13E+01 | 4 00E-04 | o | 1 28E+05 | 9 62E-01 | 96 18% | Y |
| Beryllium | 1 70E+00 | 5 00E-03 | o | 3 40E+02 | 2 55E 03 | 0 25% | N |
| Bis(2 ethylhexyl)phthalate | 8 00E-02 | 2 00E-02 | o | 4 00E+00 | 3 00E-05 | 0 00% | No |
| Fluoranthene | 9 70E-02 | 4 00E-02 | o | 2 43E+00 | 1 82E-05 | 0 00% | N |
| Methylene chlorid | 5 00E-03 | 6 00E-02 | | 8 33E 02 | 6 25E 07 | 0 00% | N |
| Nickel | 2 50E+01 | 2 00E-02 | o | 1 25E+03 | 9 37E-03 | 0 94% | N |
| Phenanthrene | 8 20E-02 | n/a | | | | | N |
| Pyrene | 9 70E-02 | 3 00E-02 | o | 3 23E+00 | 2 42E 05 | 0 00% | N |
| Tetrachloroethene | 1 00E-03 | 1 00E 02 | o | 1 00E-01 | 7 50E 07 | 0 00% | N |
| Zin | 1 05E+03 | 3 00E-01 | o | 3 50E+03 | 2 62E 02 | 2 62% | Y s |
| | | T tal Risk Fa tor (Rj) | = | 1 33E+05 | T tal % = | 100% | |

N t
( ) Th m t i stri ti f th oral r inhalati n r f r n d s i us d
(1) i l
(a) Appli bl t x l gi l rit ria i n t av ilabl

## Table 6-17
**Rocky Flats OU 5 Concentration/Toxicity Screen of Carcinogens in Seep Sediment**

| PCOC | Maximum Concentration (mg/kg) | Slope Factor (mg/kg-day)$^{-1}$ (a) | Type of Slope Factor (b) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Carcinogens | | | | | | | |
| Benzo(a)anthracen | 3 80E-02 | 7 30E-01 | o | 2 77E-02 | 1 94E 03 | 0 19% | No |
| B ryllium | 1 70E+00 | 8 40F+00 | i | 1 43E+01 | 9 98F 01 | 99 80% | Y |
| Bis(2 ethylh xyl)phthalat | 8 00E-02 | 1 40E-02 | o | 1 12E-03 | 7 83E-05 | 0 01 % | N |
| Chrysene | 4 10E-02 | 7 30E-03 | o | 2 99E-04 | 2 09E-05 | 0 00% | No |
| Methylene chloride | 5 00E-03 | 7 50E-03 | o | 3 75E-05 | 2 62E-06 | 0 00% | No |
| Tetrachloroethene | 1 00E-03 | 5 20E-02 | o | 5 20E-05 | 3 63E-06 | 0 00% | No |
| | | Total Risk Factor (Rj) | = | 1 43E+01 | Total % = | 100% | |

Notes
(a) The most restrictive f the oral or inhalation slope fact r is used
(b) o = oral i = inhalati n

## Table 6-18
**Rocky Flats OU 5 Concentration/Toxicity Screen of Radionuclides in Seep Sediment**

| PCOC | Maximum Concentration (pCi/g) | Slope Factor (risk/pCi) [a] | Type of Slope Factor [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | |
| Uranium 233/234 | 2.00E+00 | 2 70E-08 | i | 5 40E 08 | 3 70E 01 | 36 97% | Yes |
| Uranium 235 | 1 30E 01 | 2 50E-08 | i | 3 25E 09 | 2 23E 02 | 2 23% | Yes |
| Uranium 238 | 3 70E+00 | 2 40E-08 | i | 8 88E-08 | 6 08E 01 | 60 80% | Y s |
| | | T tal Risk Fa tor (Rj) | = | 1 46E 07 | T tal % = | 100% | |

Notes
(a) The most restrictive of the oral or inhalation slope fa tor is used
(b) i = inhalation

## Table 6-19
## Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Stream Sediment

| PCOC | Maximum Concentration (mg/kg) | RfD (mg/kg day) [a] | Type of RfD [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Copper | 1 36E+02 | 4 00E-02 | o | 3 39E+03 | 8 22E-02 | 8 22% | Y s |
| Mercury | 3 05E+00 | 8 60E-05 | ı | 3 55E+04 | 8 60E-01 | 86 05% | Yes |
| Zinc | 7 09E+02 | 3 00E-01 | o | 2 36E+03 | 5 73E-02 | 5 73% | Yes |
| | | Total Risk Factor (Rj) | = | 4 12E+04 | Total % = | 100% | |

N tes

(a) The most restrictive of the oral or inhalation reference dose is used

(b) o = oral ı = inhalation

**Table 6-16**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Seep Sediment**

| PCOC | Maximum Concentration (mg/kg) | RfD (mg/kg-day) (a) | Type of RfD (b) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Acetone | 1 70E-02 | 1 00E-01 | o | 1 70E-01 | 1 27E-06 | 0 00% | No |
| Antimony | 5 13E+01 | 4 00E-04 | o | 1 28E+05 | 9 62E-01 | 96 18% | Y s |
| Beryllium | 1 70E+00 | 5 00E-03 | o | 3 40E+02 | 2 55E 03 | 0 25% | N |
| Bis(2 ethylhexyl)phthalate | 8 00E-02 | 2 00E-02 | o | 4 00E+00 | 3 00E-05 | 0 00% | No |
| Fluoranthene | 9 70E-02 | 4 00E-02 | o | 2 43E+00 | 1 82E-05 | 0 00% | N( |
| Methylene chloride | 5 00E-03 | 6 00E-02 | o | 8 33E 02 | 6 25E 07 | 0 00% | N |
| Nickel | 2 50E+01 | 2 00E-02 | o | 1 25E+03 | 9 37E 03 | 0 94% | N |
| Phenanthrene | 8 20E-02 | n/a | | | | | N |
| Pyrene | 9 70E-02 | 3 00E-02 | o | 3 23E+00 | 2 42E-05 | 0 00% | N |
| Tetrachloroethene | 1 00E-03 | 1 00E-02 | o | 1 00E-01 | 7 50E 07 | 0 00% | N |
| Zinc | 1 05E+03 | 3 00E-01 | o | 3 50E+03 | 2 62E 02 | 2 62% | Y s |
| | | T tal Risk Fa tor (Rj) | = | 1 33E+05 | T tal % = | 100% | |

N t
( ) Th [illegible] t [illegible] sti [illegible] f th [illegible] ral or inh lation r f r nc d [illegible] u d
(b) – [illegible]
(n/a) Appli abl t xi l gi l rit ria n t availabl

**Table 6-18**
**Rocky Flats OU 5 Concentration/Toxicity Screen of Radionuclides in Seep Sediment**

| PCOC | Maximum Concentration (pCi/g) | Slope Factor (risk/pCi) (a) | Type of Slope Factor (b) | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | |
| Uranium 233/234 | 2.00E+00 | 2 70E-08 | i | 5 40E-08 | 3 70E-01 | 36 97% | Yes |
| Uranium 235 | 1 30E-01 | 2 50E-08 | i | 3 25E 09 | 2 23E-02 | 2 23% | Yes |
| Uranium 238 | 3 70E+00 | 2 40E-08 | i | 8 88E-08 | 6 08E 01 | 60 80% | Y s |
| | | T tal Risk Factor (Rj) | = | 1 46E-07 | T tal % = | 100% | |

Notes
(a) The most restrictive of the oral or inhalation slope factor is used
(b) i = inhalation

## Table 6-19
## Rocky Flats OU 5 Concentration/Toxicity Screen of Noncarcinogens in Stream Sediment

| PCOC | Maximum Concentration (mg/kg) | RfD (mg/kg day) [a] | Type of RfD [b] | Chemical Specific Risk Factor (Ri) | Ratio of Ri/Rj | Percentage of Total Risk Factor | Consider a COC? |
|---|---|---|---|---|---|---|---|
| Noncarcinogens | | | | | | | |
| Copper | 1 36E+02 | 4 00E 02 | | 3 39E+03 | 8 22E 02 | 8 22% | Y s |
| Mercury | 3 05E+00 | 8 60E-05 | i | 3 55E+04 | 8 60E 01 | 86 05% | Ye |
| Zinc | 7 09E+02 | 3 00E 01 | o | 2 36E+03 | 5 73E 02 | 5 73% | Yes |
| | | Total Risk Factor (Rj) | = | 4 12E+04 | Total % = | 100% | |

N tes
(a) The most restrictive of the oral or inhalation reference dose is used
(b) o = oral i = inhalation

## Table 6-21

**Rocky Flats OU 5 Comparison of Concentrations to RBCs for Infrequently Detected Analytes in Surface Soil**

| Analyte | Range of Detected Concentrations (mg/kg) Minimum | Maximum | Detection Frequency (%) | Range of Reporting Limits (mg/kg) | Range of Non-detect Values (mg/kg) Minimum | Maximum | Residential Soil RBC (mg/kg)[a] | Max. Detected Concentration > RBC? | Max. Detected Con entration 1000 x RBC? | Max Non detect> | Percent of Non dete t> |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | | | |
| Acenaphthylene | 6 00E-01 | 6.00E-01 | 1 3 | 3 30E-1 1 5E+00 | 3 50E-01 | 2 30E 00 | n/ | | | | |
| Aldrin | 1 70E-02 | 1 70E-02 | 1 4 | 8 00E-03 | 8 00E-03 | 8.50E-02 | 3 77E-02 | N | N | Y | 6 9 |
| Butylbenzylphthal te | 2 20E-01 | 2 20E-01 | 1 3 | 3 30E-01 | 3 50E-01 | 1 10E 00 | 5 49E 04 | N | N | N | 0 0 |
| 4,4-DDT | 2 10E-02 | 2 10E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | 1 88E 00 | N | N | N | 0 0 |
| Dieldrin | 3 40E-02 | 3 40E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | 4 00E-02 | N | N | Y | 20 8 |
| Di -octyl phthal te | 8 30E-02 | 8 30E-02 | 1 3 | 3 30E-01 | 3 50E-01 | 1 10E 00 | 4 57E+01 | N | N | N | 0 0 |
| Endosulfan sulf te | 2 40E-02 | 2 40E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | 1 65E 03 | N | N | N | 0 0 |
| Endrin k tone | 3 60E-02 | 3 60E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | n/ | | | | |
| H ptachlor poxide | 1 00E-02 | 1 00E-02 | 1 4 | 8 00E-03 | 8 00E-03 | 8 50E-02 | 7 04E-02 | N | N | Y | 1 4 |
| Isophorone | 9 60E-02 | 9 60E-02 | 1 3 | 3 30E-01 | 3 50E-01 | 1 10E 00 | 6 74E+02 | N | N | N | 0 0 |
| M tho ychlor | 4 50E-01 | 4 50E-01 | 1 4 | 8 00E-03 8 00E-02 | 8 00E-02 | 8 50E-01 | 1 37E 03 | N | N | N | 0 0 |
| **Inorganics** | | | | | | | | | | | |
| Antimony | 3 98E 01 | 4 98E+01 | 2 4 | 1 20E 01 | 1 20E 01 | 1 76E+01 | 1 10E 02 | N | N | N | 0 0 |

N t

( )/ Appl cabl RBC t al bl

( Rocky Fl t I I RC a u ed RBC

**Table 6-21**
**Rocky Flats OU 5 Comparison of Concentrations to RBCs for Infrequently Detected Analytes in Surface Soil**

| Analyt | Rang of Det cted Conc ntrations (mg/kg) Minimum | Maximum | Det tion Frequency (%) | Rang of R porting Limit (mg/kg) | Rang of Non-detect Values (mg/kg) Minimum | Maximum | Re id ntial Soil RBC (mg/kg)[a] | Max. D tected Concentration > RBC? | Max D t t d Conc ntration 1000 x RBC? | Max Non d t t> | P rcent of Non d t t> |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Organic** | | | | | | | | | | | |
| A enaphthyl n | 6 00E-01 | 6 00E-01 | 1 3 | 3 30E 1 1 5E 00 | 3 50E-01 | 2 30E 00 | n/ | | | | |
| Aldn | 1 70E-02 | 1 70E-02 | 1 4 | 8 00E-03 | 8 00E-03 | 8 50E-02 | 3 77E-02 | N | N | Y | 6 9 |
| Butylbenzylphthal te | 2 20E-01 | 2 20E-01 | 1 3 | 3 30E-01 | 3 50E-01 | 1 10E 00 | 5 49E 04 | N | N | N | 0 0 |
| 4,4-DDT | 2.10E-02 | 2 10E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | 1 88E 00 | N | N | N | 0 0 |
| Di ldrin | 3 40E-02 | 3 40E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | 4 00E-02 | N | N | Y | 20 8 |
| Di -octyl phthal te | 8 30E-02 | 8 30E-02 | 1 3 | 3 30E-01 | 3 50E-01 | 1 10E 00 | 4 57E 01 | N | N | N | 0 0 |
| Endo ulf n sulfate | 2 40E-02 | 2.40E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | 1 65E 03 | N | N | N | 0 0 |
| E drin k tone | 3 60E-02 | 3 60E-02 | 1 4 | 8 00E-03 1 60E-02 | 1 60E-02 | 1 70E-01 | n/ | | | | |
| H ptachl r po de | 1 00E-02 | 1 00E-02 | 1 4 | 8 00E-03 | 8 00E-03 | 8 50E-02 | 7 04E-02 | N | N | Y | 1 4 |
| Isophorone | 9 60E-02 | 9 60E-02 | 1 3 | 3 30E-01 | 3 50E-01 | 1 10E 00 | 6 74E 02 | N | N | N | 0 0 |
| M tho y hlor | 4 50E-01 | 4 50E-01 | 1 4 | 8 00E-03 8 00E-02 | 8 00E-02 | 8 50E-01 | 1 37E 03 | N | N | N | 0 0 |
| **Inorganics** | | | | | | | | | | | |
| Antimony | 3 98E 01 | 4 98E+01 | 2 4 | 1 20E 01 | 1 20E 01 | 1 76E 01 | 1 10E 02 | N | N | N | 0 0 |

N

( √ Appl cabl RBC t ail bl
( Rocky Fl t I PRC ar u ed RBC

Table 6-23

Rocky Flats OU 5 Comparison of Concentrations to RBCs for Infrequently Detected Analytes in Groundwater

| Analyte | Range of Detected Concentrations (mg/L) | | Detection Frequency (%) | Range of Reporting Limits (mg/L) | Range of Non-detect Value (mg/L) | | Residential Groundwater RBC | Max. Detected Con entration > RBC? | Max. Dete t d Concentration > 1000 x RBC? | Max Non detect> | Percent of Non detect> |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum | Maximum | | | Minimum | Maximum | | | | | |
| M thylene chl ride | 6.00E-03 | 6.00E-03 | 4 8 | 1 00E-04 1 00E-02 | 1 00E-04 | 1 00E-02 | 6 22E-03 | N | N | Y | 4 4 |

Note

( ) Rocky Fl t PPRG ar used as RBC

**Table 6-23**
**Rocky Flats OU 5 Comparison of Concentrations to RBCs for Infrequently Detected Analytes in Groundwater**

| Analyte | Range f Det ct d Con ntrations (mg/L) | | Detection Frequ n y (%) | Rang of Reporting Limit (mg/L) | Range of Non-d t ct Value (mg/L) | | Re id ntial Groundwat RBC | Max. D te t d Con ntration > RBC? | Max Dete t d Con ntration 1000 x RBC? | Max Non d t t> | P rc nt of Non det t> |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum | Maximum | | | Minimum | Maximum | | | | | |
| M thyl hl rnd | 6.00E-03 | 6 00E-03 | 4 8 | 1 00E-04 1 00E-02 | 1 00E-04 | 1 00E-02 | 6 22E-03 | N | N | Y | 4 4 |

N te

( ) Ro ky Fl t PPRG ar used as RBC

**Table 6 25**
**Rocky Flats OU 5 Summary of Chemicals of Concern by Medium**

| Chemical of Concern | Surfac e Soil | Subsurface Soil | Groun d-water | Surface Water | Seep Water | Pond Sedimen t | Seep Sedimen t | Stream Sedimen t |
|---|---|---|---|---|---|---|---|---|
| Acetone | | | | | X | | | |
| Aluminum | | | X | | | | | |
| Antimony | | X | | | | | X | |
| Aroclor 1254 | X | X | | | | | | |
| Barium | | | X | X | | | | |
| Benzo(a)anthracene | X | X | | | | | | |
| Benzo(a)pyrene | X | X | | | | | | |
| Benzo(b)fluoranthene | X | X | | | | | | |
| Beryllium | | X | X | | | | X | |
| Cadmium | | X | | | | | | |
| Copper | X | X | | | | | | X |
| Dibenzo(a h)anthracene | X | | | | | | | |
| 1,1 Dichloroethene | | | | | X | | | |
| 1,2 Dichloroethene | | | | | X | | | |
| Fluoranthene | X | | | | | | | |
| Indeno(1,2 3-cd)pyrene | X | | | | | | | |
| Lithium | | | | X | | | | |
| Manganese | | | X | | | | | |
| Mercury | X | | | | | X | | X |
| Molybdenum | | X | | | | | | |
| Nickel | | X | | | | | | |
| Pyrene | X | | | | | | | |
| Silver | X | X | | | | | | |
| Strontium | | | | X | | | | |
| Tetrachloroethene | | | | | X | | | |
| Trichloroethene | | | | | X | | | |
| Vanadium | | | X | | | | | |
| Zinc | | | | | | X | X | X |

Table 6-25 (continued)

| Chemical of Concern | Surface Soil | Subsurface Soil | Ground-water | Surface Water | Seep Water | Pond Sediment | Seep Sediment | Stream Sediment |
|---|---|---|---|---|---|---|---|---|
| Radionuclides | | | | | | | | |
| Americium 241 | | | X | X | | X | | X |
| Plutonium 239/240 | | | X | | | X | | X |
| Radium 226 | | | X | | | | | |
| Uranium 233/234 | X | X | X | X | | X | X | |
| Uranium 235 | X | X | X | | | X | X | |
| Uranium 238 | X | X | X | X | | X | X | |

**Table 6 26**
**Summary of Current and Future Land Uses[a b]**

| Land Use Category | Current | | Future | |
|---|---|---|---|---|
| | Offsite | Onsite (OU 5) | Offsite | Onsite (OU 5) |
| Residential | Yes | No | Credible | Improbable |
| Office Complex | Yes | No | Credible | Credible |
| Commercial/Industrial | Yes | No | Credible | Improbable |
| Open Space | Yes | No | Credible | Credible[d] |
| Ecological Reserve | No | No | Improbable | Credible[d] |
| Agricultural | Yes | No | Credible | Improbable |
| Gravel Mining | Yes | No | Credible | Improbable[c] |

**Credible is used to indicate scenarios that may reasonably occur**
**[b] Improbable is used to indicate scenarios that are unlikely to occur**
**Expected in the currently developed area of the plant site but not in the OU 5 area**
**[d] Expected in the Site buffer zone including the OU 5 area**

**Table 6-27**
**Rocky Flats OU 5 Receptors and Pathways**

| Potentially Exposed Receptor | Potentially Complete Exposure Pathways by AOC | | |
|---|---|---|---|
| | IHSS 115/196 Source Area (AOC 1) | IHSS 133 Source Area (AOC 2) | SID C 2 Woman Creek C 1 Source Area (AOC 3) |
| **Current** | | | |
| Onsite worker (security guard) | Dermal contact with surface soil<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>External irradiation | Dermal contact with surface soil<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>External irradiation | No exposure |
| **Future** | | | |
| Onsite construction worker | Dermal contact with surface and subsurface soil<br>Dermal contact with seep sediments<br>Inhalation of airborne particulates<br>Ingestion of surface and subsurface soil<br>External irradiation | Dermal contact with surface and subsurface soil<br>Dermal contact with seep sediments<br>Inhalation of airborne particulates<br>Ingestion of surface and subsurface soil<br>External irradiation | No exposure |
| Onsite office worker | Dermal contact with surface soil<br>Dermal contact with seep sediments Inhalation of VOCs in indoor air<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>External irradiation | Dermal contact with surface soil<br>Dermal contact with seep sediments<br>Inhalation of VOCs in indoor air<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>External irradiation | No exposure |

TABLE 6-27 (Continued)

| Potentially Exposed Receptor | Potentially Complete Exposure Pathways by AOC | | |
|---|---|---|---|
| | IHSS 115/196 Source Area (AOC 1) | IHSS 133 Source Area (AOC 2) | SID C-2 Woman Creek, C 1 Source Area (AOC 3) |
| Onsite ecological researcher | Dermal contact with surface soil<br>Dermal contact with seep sediments<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>Ingestion of seep sediments<br>External irradiation | Dermal contact with surface soil<br>Dermal contact with seep sediments<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>Ingestion of seep sediments<br>External irradiation | Dermal contact with surface water<br>Dermal contact with sediments<br>Ingestion of surface water<br>Ingestion of sediments |
| Onsite open-space receptor | Dermal contact with surface soil<br>Dermal contact with seep sediments<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>Ingestion of seep sediments<br>External irradiation | Dermal contact with surface soil<br>Dermal contact with seep sediments<br>Inhalation of airborne particulates<br>Ingestion of surface soil<br>Ingestion of seep sediments<br>External irradiation | Dermal contact with surface water<br>Dermal contact with sediments<br>Ingestion of surface water<br>Ingestion of sediments |

## Table 6 28
## Chemical Specific Concentrations for AOC1

| ( h mı l f Con rn | Surfa Soıl (mg/kg) | Sub urf Soıl (mg/kg) | Groundw t r (mg/l ) | Surface W ter (mg/l ) | Sc p W t r (mg/l ) | P nd Sedımcnt (mg/kg) | Se p Sedımcnt (mg/kg) | St m Sed m nt (mg/kg) | (p rtı ul te ) ( g/m ) |
|---|---|---|---|---|---|---|---|---|---|
| A ton | | | | | 6 5E 02 | | | | |
| Alumınum | | | 1 2E+02 | | | | | | |
| Antımony | | 7 2E+00 | | | | | 5 1E+01 | | |
| Arocl r 1254 | 6 1E 01 | 2 1E-01 | | | | | | | 3 8E 09 |
| B rıum | | | 1 5E 00 | | | | | | |
| Benzo(a)anthrac ne | 1 1E+00 | 1 2E+00 | | | | | | | 1 7F 08 |
| Benzo(a)pyrene | 8 2E-01 | 1 1E+00 | | | | | | | 1 6E 08 |
| Benzo(b)fluoranthene | 1 1E+00 | 1 2E+00 | | | | | | | 1 9E 08 |
| Beryllıum | | 7 8E 01 | 9 6E 03 | | | | 1 7E+00 | | |
| Cadmıum | | 5 9E 01 | | | | | | | |
| Copper | 2 7E+01 | 4 4E+01 | | | | | | | 1 7F 10 |
| Dıbenzo(a,h)anthracene | 5 0E-01 | | | | | | | | 3 5E 09 |
| 1,1 Dıchl roethene | | | | | 4 0E 03 | | | | |
| 1,2-Dıchloroethene | | | | | 4 0E-03 | | | | |
| Fl ranth n | 1 9E+00 | | | | | | | | 4 8F 08 |
| I d (1,2,3 d)pyre | 1 4E+00 | | | | | | | | 1 2F 08 |
| Lıthıu n | | | | | | | | | |
| M g n | | | 7 8E+00 | | | | | | |
| M rcury | 1 2E 01 | | | | | | | | 7 2E 12 |
| M lybdenum | | 2 5F+01 | | | | | | | |
| N k l | | 2 1E+01 | | | | | | | |
| Pyren | 1 7E+00 | | | | | | | | 4 3E 08 |
| Sıl r | 1 6E+00 | 2 2E+00 | | | | | | | 5 8E 14 |
| Strontıum | | | | | | | | | |
| Tetrachloroethene | | | | | 2 8E-02 | | | | |
| Trıchloroethene | | | | | 7 0E-03 | | | | |
| Vanadıum | | | 2.8E-01 | | | | | | |
| Zınc | | | | | | | 7 0E+01 | | |
| Amerıcıum 241 | | | 9 0E-02 | | | | | | 1 6E 08 |
| Plutonıum-239/240 | | | 4.5E-01 | | | | | | 5 3E 08 |
| Radıum-226 | | | 4 4E+00 | | | | | | |
| Uranıum-233/234 | 9 6E+00 | 1 7E+00 | 4 9E+01 | | | | 1 4E+00 | | 6 6E 05 |
| Uranıum-235 | 2 7E+00 | 1 3E-01 | 4 0E+00 | | | | 1 1E-01 | | 1 6E 05 |
| Uranıum-238 | 8 1E+01 | 1 6E+00 | 4 4E+01 | | | | 1 2E+00 | | 8 8F 04 |

NOTE R dıonuclıde conc ntr tıons re ın unıts f pCı/g f r soıl pCı/l f r water and pCı/m for aır

## Table 6-29
## Chemical-specific Concentrations for AOC2

| Chem l f( r | Surface Soil (mg/kg) | Subsurface Soil (mg/kg) | ( roundw ter (mg/l ) | Surface Water (mg/l ) | Se p W t (mg/l ) | l nd Sediment (mg/kg) | Seep Sediment (mg/kg) | Stre m Sed ment ( g/kg) | Air (p rti ul t ) ( m/ ) |
|---|---|---|---|---|---|---|---|---|---|
| Aceton | | | | | | | | | |
| Aluminum | | | 3 6E+02 | | | | | | |
| Antimony | | 9 5E+00 | | | | | 4 4E+01 | | |
| Aroclor 1254 | | | | | | | | | |
| Barium | | | 2.7E+00 | | | | | | |
| Benzo(a) nthrac ne | | | | | | | | | |
| Benz (a)pyren | 3 7E-01 | | | | | | | | 4 [illegible]E 10 |
| Benzo(b)fluoranthene | 7 4E-03 | | | | | | | | 4 0E 11 |
| Beryllium | | 1 3E+00 | 2 9E-02 | | | | 1 5E+00 | | |
| Cadmium | | 1 3E+00 | | | | | | | |
| Copper | 1 8E+01 | 4 1E+01 | | | | | | | 9 6E 11 |
| Dibenzo(a,h)anthrac ne | 1 3E 02 | | | | | | | | 6 5E 11 |
| 1,1 Dichloroethene | | | | | 2 5E 03 | | | | |
| 1,2-Dichloroethene | | | | | 2 5E 03 | | | | |
| Flu ranth n | 8 9E 02 | | | | | | | | 4 7E 10 |
| Ind no(1,2,3 d)pyr n | 1 8E 02 | | | | | | | | 9 5E 11 |
| l tl | | | | | | | | | |
| M I | | | 3 5E 00 | | | | | | |
| M ury | 8 0E 02 | | | | | | | | 4 2E 15 |
| M lybden | | 2 2E 01 | | | | | | | |
| N k l | | 2 3E 01 | | | | | | | |
| Pyr | 1 1E 01 | | | | | | | | 5 6E 10 |
| Silv r | 1 6E+00 | 4 3E+00 | | | | | | | 0 0E+00 |
| Strontium | | | | | | | | | |
| Tetrachloroeth n | | | | | 2 5E-03 | | | | |
| Trichloroethen | | | | | 2 5E 03 | | | | |
| Vanadium | | | 6 7E-01 | | | | | | |
| Zinc | | | | | | | 1 1E+03 | | |
| Americium 241 | | | 6 0E 02 | | | | | | 1 5E-07 |
| Plutonium-239/240 | | | 3 3E-01 | | | | | | 4 9E 07 |
| Radium-226 | | | 3 9E+00 | | | | | | |
| Uranium-233/234 | 5 2E+00 | 3 4E+00 | 7 6E+00 | | | | 2 0E 00 | | 6 1E 05 |
| Uranium 235 | 3 5E-01 | 5 9E 01 | 4 7E-01 | | | | 1 3E 01 | | 8 3E 06 |
| Ura ium 238 | 1 4E+01 | 9 1E 00 | 1 1E 01 | | | | 3 7E 00 | | 3 6E 04 |

NOTE R di nu lid n t at n are unit f pCi/g f r so l d pCi/m f r i

**Table 6 30**
**Chemical specific Concentrations for AOC3**

| (h mı l of C ›n rn | Surf Soil (mg/kg) | Subsurf Soil (mg/kg) | Groundwater (mg/l ) | Surface Water (mg/L) | Se p Water (mg/l ) | I nd Sediment (mg/kg) | Se p Sed ment (mg/kg) | Stre m Sediment ( ng/kg) | Air (partı ul te ) (mg/m ) |
|---|---|---|---|---|---|---|---|---|---|
| A eton | | | | | | | | | |
| Alumınum | | | 5 2E+00 | | | | | | |
| Antımony | | 6 0E+00 | | | | | | | |
| Arocl ›r 1254 | | 2 1E 01 | | | | | | | 1 6E 10 |
| B rıum | | | 9 4E-02 | 1 0E 01 | | | | | |
| Benzo(a)anthracene | | 4 4E 01 | | | | | | | 1 7E 10 |
| Benzo(a)pyrene | | 4 4E 01 | | | | | | | 1 4E-10 |
| Benzo(b)fluoranthen | | 4 4E-01 | | | | | | | 1 9E-10 |
| Beryllıum | | 1 5E+00 | 4 0E-03 | | | | | | |
| Cadmıum | | 5 2E+00 | | | | | | | |
| C pper | | 3 4E+01 | | | | | | 2 2E+02 | 9 5E 12 |
| Dıbenzo(a,h)anthracene | | | | | | | | | 6 5E 11 |
| 1,1 Dıchloroethene | | | | | | | | | |
| 1,2-Dıchloroethene | | | | | | | | | |
| Flu ranth n | | | | | | | | | 2 4E 10 |
| Indeno(1,2,3 d)pyren | | | | | | | | | 8 0E 11 |
| I thıum | | | | 2 2E 02 | | | | | |
| M ng n | | | 1 6E+01 | | | | | | |
| M u y | | | | | | 1 6E+00 | | 2 2E+00 | 4 0E 14 |
| M lybd num | | 2 0E+01 | | | | | | | |
| N k l | | 1.8E+01 | | | | | | | |
| I yrcn | | | | | | | | | 2 8E 10 |
| Sıl r | | 1 0E+00 | | | | | | | 2 4E 13 |
| Strontıum | | | | 3 1E 01 | | | | | |
| T trachloroeth | | | | | | | | | |
| Trıchloroethene | | | | | | | | | |
| Vanadium | | | 4 3E-02 | | | | | | |
| Zınc | | | | | | 2 4E+02 | | 6 0E+02 | |
| Americium-241 | | | 5 0E-01 | 8 0E-02 | | 4 5E 01 | | 2 9E-01 | 7 1E-09 |
| Plutonium-239/240 | | | 1 0E-02 | | | 2.5E+00 | | 1 6E+00 | 2 3E 08 |
| Radium-226 | | | 4 6E+02 | | | | | | |
| Uranıum-233/234 | | 1 1E+00 | 3 1E+03 | 1 9E+00 | | 3 3E+00 | | | 3 7E 06 |
| Uranıum-235 | | 9.0E-02 | 1 4E+00 | | | 2 1E-01 | | | 4 8E 07 |
| Uranıum-238 | | 1 6E+00 | 8 3E-01 | 2 1E+00 | | 2 9E+00 | | | 2 5E-05 |

NOTE R di nuclide ncentration are in units f pCi/g for soil pCi/L for w ter nd pCi/m f r air

## Table 6-31
## OU5 COC Chemical-Specific Parameters

| Analyte | Oral RfD (mg/kg day) | Oral CSF (mg/kg day) | Inhalation RfD (mg/kg day) | Inhalation CSF (mg/kg day) | External CSF (risk/yr per pCi/g) | EPA Cancer Weight of Evidence | Dermal Absorption Factor | Dermal Permeability (cm/hr) | GI Matrix Effect |
|---|---|---|---|---|---|---|---|---|---|
| Acetone | 1 00E 01 | NA | NA | NA | NA | NA | NA | 6 00E 4 | 1 00E+00 |
| Aluminum | 2 90E+00 | NA | NA | NA | NA | NA | NA | NA | 1 00E+00 |
| Antimony | 4 00E 04 | NA | NA | NA | NA | NA | NA | NA | 5 00E 01 |
| Aroclor 1254 | 2 00E 05 | 7 70E+00 | NA | NA | NA | B2 | 6 00E-02 | 7 10E 01 | 5 00E 01 |
| Barium | 7 00E 02 | NA | 1 43E 04 | NA | NA | NA | NA | NA | 1 00E+00 |
| Benzo(a)anthracene | NA | 7 30E 01 | NA | NA | NA | B2 | 5 00E 02 | 8 10E 01 | 1 00E+00 |
| Benzo(a)pyrene | NA | 7 30E+00 | NA | NA | NA | B2 | 5 00E 02 | 1 20E+00 | 1 00E+00 |
| Benzo(b)fluoranthene | NA | 7 30E 01 | NA | NA | NA | B2 | 5 00E 02 | 1 20E+00 | 1 00E+00 |
| Beryllium | 5 00E 03 | 4 30E+00 | NA | 8 40E+00 | NA | B2 | NA | NA | 5 00E 01 |
| Cadmium | 1 00E 03 | NA | NA | 6 30E+00 | NA | NA | 1 00E 02 | NA | 1 00E+00 |
| Copper | 4 00E 02 | NA | NA | NA | NA | D | NA | NA | 1 00E+00 |
| Dibenzo(a h)anthracene | NA | 7 30E+00 | NA | NA | NA | B2 | 5 00E 02 | 2 70E+00 | 1 00E+00 |
| 1 1 Dichloroethene | 9 00E 03 | 6 00E 01 | NA | 1 20E+00 | NA | C | NA | 1 60E 02 | 1 00E+00 |
| 1 2 Dichloroethene | 9 00E 03 | NA | NA | NA | NA | NA | NA | 1 00E 02 | 1 00E+00 |
| Fluoranthene | 4 00E 02 | NA | NA | NA | NA | NA | 5 00E 02 | 3 60E 01 | 5 00E 01 |
| Indeno(1 2 3-cd)pyrene | NA | 7 30E 01 | NA | NA | NA | B2 | 5 00E 02 | 1 90E+00 | 1 00E+00 |
| Lithium | 2 00E 02 | NA | NA | NA | NA | NA | NA | NA | 1 00E+00 |
| Maganese | 5 00E 03 | NA | 1 43E 05 | NA | NA | D | NA | NA | 1 00E+00 |

## Table 6 31 (Continued)

| Analyte | Oral RfD (mg/kg day) | Oral CSF (mg/kg day) | Inhalation RfD (mg/kg day) | Inhalation CSF (mg/kg day) | External CSF (risk/yr per pCi/g) | EPA Cancer Weight of Evidence | Dermal Absorption Factor | Dermal Permeability (cm/hr) | GI Matrix Effect |
|---|---|---|---|---|---|---|---|---|---|
| Mercury | 3 00E 04 | NA | 8 60E 05 | NA | NA | D | NA | NA | 1 00E+00 |
| Molybdenum | 5 00E-03 | NA | NA | NA | NA | NA | NA | NA | 1 00E+00 |
| Nickel | 2 00E 02 | NA | NA | NA | NA | NA | NA | NA | 1 00E+00 |
| Pyrene | 3 00E-02 | NA | NA | NA | NA | D | 5 00E 02 | NA | 5 00E 01 |
| Silver | 5 00E 03 | NA | NA | NA | NA | D | NA | NA | 1 00E+00 |
| Strontium | 6 00E 01 | NA | NA | NA | NA | NA | NA | NA | 1 00E+00 |
| Tetrachloroethene | 1 00E 02 | 5 20E 02 | NA | 2 00E 03 | NA | B2 | NA | 3 70E 01 | 1 00E+00 |
| Trichloroethene | NA | 1 10E 02 | NA | 6 00E 03 | NA | B2 | NA | 2 30E 01 | 1 00E+00 |
| Vanadium | 7 00E 03 | NA | NA | NA | NA | NA | NA | NA | 1 00E+00 |
| Zinc | 3 00E 01 | NA | NA | NA | NA | D | NA | NA | 1 00E+00 |
| Americium 241 | NA | 2 40E 10 | NA | 3 20E 08 | 4 90E 09 | A | NA | NA | 1 00E+00 |
| Plutonium 239/240 | NA | 2 30E 10 | NA | 3 80E 08 | 2 70E 11 | A | NA | NA | 1 00E+00 |
| Radium 226 | NA | 1 20E 10 | NA | 3 00E 09 | 6 00E 06 | A | NA | NA | 1 00E+00 |
| Uranium 233/234 | NA | 1 60E 11 | NA | 2 70E 08 | 4 20E 11 | A | NA | NA | 1 00E+00 |
| Uranium 235 | NA | 1 60E 11 | NA | 2 50E 08 | 2 40E 07 | A | NA | NA | 1 00E+00 |
| Uranium 238 | NA | 2 00E 11 | NA | 2 40E-08 | 5 10E 08 | A | NA | NA | 1 00E+00 |

NA= Value is not available

## Table 6-32
### Construction Worker RME Carcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | -- | | | | -- | NA | NA | NA | | NA | | | | |
| Aluminum | NA | NA | -- | -- | | | | NA | NA | NA | | NA | | | | |
| Antimony | NA | 2.9E-08 | -- | -- | | -- | | NA | NA | NA | | NA | | | | NA |
| Aroclor-1254 | 2.5E-09 | 8.5E-10 | | -- | | | | 6.0E-13 | 2.9E-09 | 1.0E-09 | | NA | | | | NA |
| Barium | NA | NA | | -- | | -- | | NA | NA | NA | | NA | | | | NA |
| Benzo(a)anthracene | 8.7E-09 | 9.3E-09 | | -- | | | | 2.8E-12 | NA | NA | | NA | | | | NA |
| Benzo(a)pyrene | 6.6E-09 | 8.8E-09 | -- | -- | -- | -- | | 2.6E-12 | NA | NA | | NA | | | | NA |
| Benzo(b)fluoranthene | 8.8E-09 | 9.8E-09 | -- | -- | | -- | | 3.0E-12 | NA | NA | | NA | | | | NA |
| Beryllium | NA | 3.1E-09 | -- | -- | | -- | | NA | NA | NA | | NA | | | | NA |
| Cadmium | NA | 4.8E-09 | -- | -- | -- | -- | | NA | NA | 4.7E-10 | | NA | | | | NA |
| Copper | 2.2E-07 | 3.5E-07 | -- | -- | -- | -- | | 2.7E-14 | NA | NA | | NA | -- | | | NA |
| Dibenzo(a,h)anthracene | 4.0E-09 | NA | -- | -- | -- | -- | | 5.6E-13 | NA | NA | | NA | | | | NA |
| 1,1-Dichloroethene | NA | NA | -- | -- | | -- | -- | NA | NA | NA | | NA | | | | NA |
| 1,2-Dichloroethene | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | | | NA |
| Fluoranthene | 7.6E-09 | NA | -- | -- | -- | -- | -- | 7.7E-12 | NA | NA | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.1E-08 | NA | -- | -- | -- | | -- | 1.8E-12 | NA | NA | | NA | | | | NA |
| Lithium | NA | NA | | | | | -- | NA | NA | NA | | NA | | | | NA |
| Manganese | NA | NA | | | | -- | | NA | NA | NA | | NA | | | | NA |
| Mercury | 9.7E-10 | NA | | | | | | 1.1E-15 | NA | NA | | NA | | | | NA |
| Molybdenum | NA | 2.[illegible]E-07 | -- | -- | -- | -- | | NA | NA | NA | | NA | | | | NA |
| Nickel | NA | 1.7E-07 | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | | | | NA |
| [illegible] | 8[illegible] | NA | -- | -- | | | | 6.8E-12 | NA | NA | | NA | | | | NA |
| [illegible] | 1.3E-08 | 1.[illegible]E-08 | -- | | | | | 9.2E-18 | NA | NA | | NA | -- | -- | | NA |
| [illegible] | NA | NA | -- | | | | | NA | NA | NA | | NA | | | | NA |
| T[illegible] | NA | NA | -- | | | | | NA | NA | NA | | NA | | | | NA |
| T[illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Vanadium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Zinc | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Americium 241 | NA | NA | | | | | | 4.5E-06 | NA | NA | | NA | | | | NA |
| Plutonium 239/240 | NA | NA | | | | | | 1.5E-05 | NA | NA | | NA | | | | NA |
| Radium 226 | NA | NA | -- | -- | | -- | -- | NA | NA | NA | | NA | | | | NA |
| Uranium 233/234 | 1.4E+02 | 2.4E+01 | -- | -- | -- | -- | | 1.9E-02 | NA | NA | -- | NA | | | | 2.9E-01 |
| Uranium 235 | 3.9E+01 | 1.9E+00 | | -- | -- | | -- | 4.4E-03 | NA | NA | -- | NA | | | | 8.2E-02 |
| Uranium 238 | 1.2E+03 | 2.2E+01 | | | -- | | -- | 2.5E-01 | NA | NA | | NA | | | | 2.4E+00 |

Note Radionuclide intakes are in units of pCi
-- = not applicable pathway
NA = not a COC for this medium [illegible] toxicity factor [illegible] not available

## Table 6-33
## Current Worker RME Carcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | | | | | NA |
| Aluminum | NA | | | | | | | NA | NA | | | | | | | NA |
| Antimony | NA | | | | | | | NA | NA | | | | | | | NA |
| Aroclor 1254 | 5.4E-08 | | | | | | | 7.5E-11 | 4.4E-07 | | | | | | | NA |
| Barium | NA | | | | | | | NA | NA | | | | | | | NA |
| Benzo(a)anthracene | 1.9E-07 | | | | | | | 3.4E-10 | NA | | | | | | | NA |
| Benzo(a)pyrene | 1.4E-07 | | | | | | | 3.2E-10 | NA | | | | | | | NA |
| Benzo(b)fluoranthene | 1.9E-07 | | | | | | | 3.7E-10 | NA | | | | | | | NA |
| Beryllium | NA | | | | | | | NA | NA | | | | | | | NA |
| Cadmium | NA | | | | | | | NA | NA | | | | | | | NA |
| Copper | 4.8E-06 | | | | | | | 3.4E-12 | NA | | | | | | | NA |
| Dibenzo(a,h)anthracene | 8.7E-08 | | | | | | | 6.9E-11 | NA | | | | | | | NA |
| 1,1-Dichloroethene | NA | | | | | | | NA | NA | | | | | | | NA |
| 1,2-Dichloroethane | NA | | | | | | | NA | NA | | | | | | | NA |
| Fluoranthene | 1.7E-07 | | | | | | | 9.5E-10 | NA | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 2.4E-07 | | | | | | | 2.3E-10 | NA | | | | | | | NA |
| Lithium | NA | | | | | | | NA | NA | | | | | | | NA |
| Manganese | NA | | | | | | | NA | NA | | | | | | | NA |
| Mercury | 2.1E-08 | | | | | | | 1.4E-13 | NA | | | | | | | NA |
| Molybdenum | NA | | | | | | | NA | NA | | | | | | | NA |
| Nickel | NA | | | | | | | NA | NA | | | | | | | NA |
| I y | 1.5E-07 | | | | | | | 8.4E-10 | NA | | | | | | | NA |
| | 2 E-07 | | | | | | | 1.1E-15 | NA | | | | | | | NA |
| | NA | | | | | | | NA | NA | | | | | | | NA |
| T | NA | | | | | | | NA | NA | | | | | | | NA |
| hlor | NA | | | | | | | NA | NA | | | | | | | NA |
| Vanadium | NA | | | | | | | NA | NA | | | | | | | NA |
| Zinc | NA | | | | | | | NA | NA | | | | | | | NA |
| Americium 241 | NA | | | | | | | NA | NA | | | | | | | NA |
| Plutonium 239/240 | NA | | | | | | | 5.5E-04 | NA | | | | | | | NA |
| Radium-226 | NA | | | | | | | 1.9E-03 | NA | | | | | | | NA |
| Uranium 233/234 | 3.0E+03 | | | | | | | NA | NA | | | | | | | 4.0E-01 |
| Uranium 235 | 8.5E+02 | | | | | | | 2.3E+00 | NA | | | | | | | 1.1E-01 |
| Uranium 238 | 2.5E+04 | | | | | | | 5.5E-01 | NA | | | | | | | 3.4E-02 |

Note Radionuclide intakes are in units of pCi

-- not an applicable pathway

NA not a COC for this medium or no toxicity factor is available

## Table 6-34
## Ecological Worker RME Carcinogenic Chemical Intakes for AOC1

| C h m als of Concer | Inge tio f S face Soil (mg/kg-day) | Inge tio f Subs rface So l (mg/kg day) | Inge tio f Pond Sediments (mg/kg-day) | Ingestio f Seep Sedim ts (mg/kg-day) | Inge ti f Stre m Sediments (mg/kg-day) | I ge tio f Surface W te (mg/kg day) | Inge tio f Seep W ter (mg/kg-day) | I halation f A rborne Part late (mg/kg-day) | Dermal Absorptio f Surface Soil (mg/kg-day) | Dermal Absorptio f Subs rface Soil (mg/kg day) | Dermal Absorptio f Pond Sedim ts (mg/kg-day) | Dermal Absorpti f Se p Sedim (mg/kg-day) | Dermal Absorptio f S re m Sed i (mg/kg lay | De al Abso ptio f S rf ce W te (mg/kg day) | Derm l Abs pt f Se p W ( g/kg-day) | E ernal Radia E posure (yea per kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | --- | --- | NA | | --- | | NA | NA | | | NA | | | | NA |
| Al m num | NA | | --- | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | --- | | 2.5E-07 | | | | NA | NA | | | NA | | | | NA |
| Aroclor-1254 | 3.0E-09 | | --- | NA | --- | | | 3 3E-12 | 1 6E-08 | | | NA | | | | NA |
| Barium | NA | | | NA | --- | | --- | NA | NA | | | NA | | | | NA |
| Benzo( )a thracene | 1 0E-08 | --- | --- | NA | --- | --- | --- | 1 5E-11 | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 7 9E-09 | --- | --- | NA | | --- | --- | 1 4E-11 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 1 1E-08 | --- | --- | NA | --- | --- | --- | 1.6E-11 | NA | | | NA | | | | NA |
| Beryllium | NA | | | 8.2E-09 | --- | --- | | NA | NA | | | NA | | | | NA |
| Cadm um | NA | --- | | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| Copper | 2.6E-07 | --- | --- | NA | --- | --- | --- | 1 5E-13 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracen | 4.8E-09 | --- | --- | NA | --- | --- | --- | 3.0E-12 | NA | | | NA | | | | NA |
| 1,1 Dichloroethene | NA | --- | --- | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| 1 2 Dichloroethene | NA | --- | | NA | --- | --- | | NA | NA | | | NA | | | | NA |
| Fluoranthene | 9 1E-09 | --- | --- | NA | --- | --- | --- | 4 2E-11 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.3E-08 | --- | | NA | --- | --- | --- | 9 9E-12 | NA | | | NA | | | | NA |
| L thi m | NA | --- | | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| M nganese | NA | --- | | NA | --- | | | NA | NA | | | NA | | | | NA |
| Merc ry | 1 2E-09 | | | NA | --- | | | 6 2E-15 | NA | | | NA | | | | NA |
| Molybde m | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| N k l | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| I yre | 8 1E 09 | | | NA | | | | 3.7E-11 | NA | | | NA | | | | NA |
| I | 1 5E 08 | | | NA | | | | 5 0E-17 | NA | | | NA | | | | NA |
| t | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T rachl h | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T bl rue h | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| V nadi m | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Z nc | NA | | | 6.7E-07 | --- | | --- | NA | NA | | | NA | | | | NA |
| Americi m 241 | NA | --- | | NA | --- | --- | --- | 2 4E-05 | NA | | | NA | | | | NA |
| Pl tonium 239/240 | NA | --- | | NA | --- | --- | --- | 8 2E-05 | NA | | | NA | | | | NA |
| Radi m 226 | NA | | | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| Uran um 233/234 | 1 6E+02 | --- | --- | 2.4E+01 | --- | --- | --- | 1 0E-01 | NA | | | NA | | | | NA |
| Uranium 235 | 4 7E+01 | --- | --- | 1 9E+00 | | | --- | 2 4E-02 | NA | | | NA | | | | 1 4E 00 |
| Urani m 238 | 1 4E+03 | --- | --- | 2.1E+01 | --- | --- | | 1 4E+00 | NA | | | NA | | | | 1 2E 01 |

Note Radi uclide i tak re in units f pCi
--- – not a ppli bl pathway
NA – not a COC for thi medium r no to city factor i a ail bl

## Table 6-35
## Office Worker RME Carcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Irradiation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | — | — | — | — | — | NA | NA | | — | NA | | | | NA |
| Aluminum | NA | — | — | — | | | — | NA | NA | | | NA | | | | NA |
| Antimony | NA | | — | — | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 5.4E-08 | — | — | — | | | | 7.5E-11 | 2.7E-07 | | | NA | | | | NA |
| Barium | NA | — | — | — | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 1.9E-07 | | — | — | — | | | 3.4E-10 | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 1.4E-07 | | — | — | — | — | — | 3.2E-10 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 1.9E-07 | — | — | — | — | — | — | 3.7E-10 | NA | | | NA | | | | NA |
| Beryllium | NA | | — | — | — | — | — | NA | NA | | | NA | | | | NA |
| Cadmium | NA | | — | — | — | — | | NA | NA | | | NA | | | | NA |
| Copper | 4.8E-06 | | — | — | — | — | — | 3.4E-12 | NA | | — | NA | | | | NA |
| Dibenzo(a,h)anthracene | 8.7E-08 | — | — | — | — | — | — | 6.9E-11 | NA | | | NA | | | | NA |
| 1,1 Dichloroethene | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA |
| 1,2 Dichloroethene | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA |
| Fluoranthene | 1.7E-07 | — | — | — | — | — | — | 9.5E-10 | NA | — | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 2.4E-07 | — | | — | — | — | — | 2.3E-10 | NA | | | NA | | | | NA |
| Lithium | NA | | — | — | — | — | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | | | | — | NA | NA | | | NA | | | | NA |
| Mercury | 2.1E-08 | | | | | | | 1.4E-13 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | | | | — | NA | NA | | — | NA | | | | NA |
| Nickel | NA | | | | | | | NA | NA | | — | NA | | | | NA |
| [illegible] | 1.5E-07 | | | | | | | 8.4E-10 | NA | | | NA | | | | NA |
| [illegible] | 2.8E-07 | | | | | | | 1.1E-15 | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | — | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | — | | | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | — | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | — | — | — | | — | 5.5E-04 | NA | | | NA | | | | NA |
| [illegible] | NA | — | — | — | — | — | — | 1.9E-03 | NA | — | — | NA | | | | NA |
| Radium 226 | NA | — | — | — | — | — | — | NA | NA | — | — | NA | | | | NA |
| Uranium 233/234 | 3.0E+03 | — | — | — | — | — | — | 2.3E+00 | NA | | — | NA | | | | 4.0E-01 |
| Uranium 235 | 8.5E+02 | — | — | — | — | | — | 5.5E-01 | NA | — | — | NA | — | | | 1.1E-01 |
| Uranium 238 | 2.5E+04 | — | | — | — | — | — | 3.1E+01 | NA | — | — | NA | | | | 3.4E-02 |

Note: Radionuclide intakes are in units of pCi

— = not an applicable pathway

NA = not a COC for this medium or no toxicity factor is available.

**Table 6-36**
**Open Space User RME Carcinogenic Chemical Intakes for AOC1**

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg day) | Ingestion of Subsurface Soil (mg/kg day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | — | — | NA | NA | | — | NA | | | | NA |
| Aluminum | NA | — | — | NA | — | | | NA | NA | | - | NA | | | | NA |
| Antimony | NA | — | — | 4.3E-07 | — | | | NA | NA | | | NA | | | | NA |
| Aroclor-1254 | 5.1E-09 | — | — | NA | — | — | — | 9.4E-12 | 8.2E-08 | | - | NA | | | | NA |
| Barium | NA | - | — | NA | — | — | | NA | NA | — | | NA | | | | NA |
| Benzo(a)anthracene | 1.8E-08 | | — | NA | — | — | | 4.3E-11 | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 1.4E-08 | — | — | NA | | | | 4.0E-11 | NA | — | — | NA | | | — | NA |
| Benzo(b)fluoranthene | 1.8E-08 | | — | NA | | | | 4.7E-11 | NA | | | NA | | | | NA |
| Beryllium | NA | — | — | 1.4E-06 | — | — | — | NA | NA | | - | NA | - | | | NA |
| Cadmium | NA | — | — | NA | — | - | — | NA | NA | — | | NA | | | | NA |
| Copper | 4.6E-07 | — | — | NA | — | — | | 4.2E-13 | NA | - | - | NA | | | | NA |
| Dibenzo(a,h)anthracene | 8.4E-09 | - | - | NA | | — | - | 8.8E-12 | NA | | - | NA | | | | NA |
| 1 1 Dichloroethene | NA | — | — | NA | | — | — | NA | NA | | | NA | | | | NA |
| 1 2 Dichloroethene | NA | — | - | NA | — | | — | NA | NA | | | NA | | | | NA |
| Fluoranthene | 1.6E-08 | — | - | NA | | | | 1.2E-10 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 2.3E-08 | - | | NA | | | | 2.9E-11 | NA | - | | NA | | | | NA |
| L thi m | NA | - | | NA | — | | | NA | NA | | | NA | | | | NA |
| M ng nese | NA | | | NA | | - | | NA | NA | | | NA | | | | NA |
| M rc ry | 2.0E-09 | - | | NA | | | | 1.8E-14 | NA | | | NA | | | | NA |
| M lybde | NA | | | NA | | | | NA | NA | - | | NA | | | | NA |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| yre | 1.4E-08 | | | NA | | | | 1.1E-10 | NA | | | NA | | | | NA |
| S | 2.7E-08 | | | NA | | | | 1.4E-16 | NA | | | NA | | | | NA |
| S | N | | | NA | | | | NA | NA | | | NA | | | | NA |
| T | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T he | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| V nad | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Z nc | NA | | | 1.2E-06 | | | - | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | — | - | NA | — | — | | 7.0E-05 | NA | - | | NA | | | | NA |
| Plutonium 239/240 | NA | - | — | NA | — | - | | 2.4E-04 | NA | | - | NA | | | | NA |
| Radium-226 | NA | — | — | NA | | - | — | NA | NA | - | - | NA | | | | NA |
| Uranium 233/234 | 2.9E+02 | — | | 4.2E+01 | — | — | | 2.9E-01 | NA | - | - | NA | | | | 5.7E 00 |
| Uranium 235 | 8.2E+01 | | — | 3.3E+00 | - | - | | 6.9E-02 | NA | — | | NA | | | | 1.6E 00 |
| Uranium 238 | 2.4E+03 | - | | 3.6E+01 | | - | - | 3.9E+00 | NA | - | | NA | | | | 4.9E+01 |

Note Radionuclide intakes are in units of pCi
— not an applicable pathway
NA not COC for this medium or no toxicity factor is available

## Table 6-37
## Construction Worker CT Carcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | -- | | | | | NA | NA | NA | | NA | | | | NA |
| Aluminum | NA | NA | -- | | | | | NA | NA | NA | | NA | | | | NA |
| Antimony | NA | 5.17E-09 | | -- | -- | | | NA | NA | NA | | NA | | | | NA |
| Aroclor 1254 | 4.40E-10 | 1.51E-10 | -- | -- | -- | | | 4.85E-13 | 5.22E-10 | 1.79E-10 | | NA | | | | NA |
| Barium | NA | NA | -- | -- | | | -- | NA | NA | NA | | NA | | | | NA |
| Benzo(a)anthracene | 1.55E-09 | 1.66E-09 | -- | -- | | -- | -- | 2.23E-12 | NA | NA | | NA | | | | NA |
| Benzo(a)pyrene | 1.17E-09 | 1.56E-09 | -- | -- | -- | -- | -- | 2.05E-12 | NA | NA | | NA | | | | NA |
| Benzo(b)fluoranthene | 1.57E-09 | 1.74E-09 | -- | -- | -- | | | 2.43E-12 | NA | NA | | NA | | | | NA |
| Beryllium | NA | 5.59E-10 | -- | -- | -- | | | NA | NA | NA | -- | NA | | | | NA |
| Cadmium | NA | 8.46E-10 | | | | -- | | NA | NA | 8.37E-11 | | NA | | | | NA |
| Copper | 3.93E-08 | 6.29E-08 | -- | -- | -- | -- | -- | 2.18E-14 | NA | NA | | NA | | | -- | NA |
| Dibenzo(a,h)anthracene | 7.18E-10 | NA | -- | -- | -- | | | 4.50E-13 | NA | NA | | NA | | | | NA |
| 1,1-Dichloroethene | NA | NA | -- | -- | | -- | -- | NA | NA | NA | | NA | | | | NA |
| 1,2-Dichloroethene | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | | | | NA |
| Fluoranthene | 1.36E-09 | NA | -- | -- | -- | -- | | 6.19E-12 | NA | NA | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.96E-09 | NA | -- | -- | -- | -- | | 1.48E-12 | NA | NA | | NA | | | | NA |
| Lithium | NA | NA | -- | -- | | -- | -- | NA | NA | NA | | NA | | | | NA |
| Manganese | NA | NA | | -- | -- | | | NA | NA | NA | -- | NA | | | | NA |
| Mercury | 1.72E-10 | NA | | -- | -- | | | 9.20E-16 | NA | NA | | NA | | | | NA |
| Molybdenum | NA | 3.59E-08 | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | 2.97E-08 | | | | | | NA | NA | NA | | NA | | | | NA |
| Pyrene | 1.21E-09 | NA | | | | | | 5.48E-12 | NA | NA | | NA | | | | NA |
| [illegible] | 2.28E-09 | 3.21E-09 | | | | | | 7.38E-18 | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| T[illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| T[illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Vanadium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Zinc | NA | NA | | | -- | | | NA | NA | NA | | NA | | | | NA |
| Americium 241 | NA | NA | | -- | | -- | -- | 3.58E-06 | NA | NA | | NA | | | | NA |
| Plutonium 239/240 | NA | NA | -- | -- | -- | -- | -- | 1.22E-05 | NA | NA | -- | NA | | | | NA |
| Radium-226 | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | -- | | | NA |
| Uranium 233/234 | 2.45E+01 | 4.31E+00 | -- | -- | -- | -- | -- | 1.51E-02 | NA | NA | -- | NA | | -- | -- | 2.30E-01 |
| Uranium 235 | 6.98E+00 | 3.33E-01 | -- | -- | -- | | -- | 3.56E-03 | NA | NA | -- | NA | -- | -- | -- | 6.53E-02 |
| Uranium 238 | 2.09E+02 | 3.98E+00 | -- | -- | -- | -- | -- | 2.02E-01 | NA | NA | -- | NA | -- | | -- | 1.95E+00 |

Note Radionuclide intakes are in units of pCi

-- = not an applicable pathway

NA - not a COC for this medium or no toxicity factor is available

## Table 6-38
## Current Worker CT Carcinogenic Chemical Intakes for AOC1

| Chemicals of C ncern | Inge io f Su face Soil (mg/kg-day) | Inge tio f Subs rface Soil (mg/kg day) | Ingestio of Pond Sediments (mg/kg-day) | Inge tio f Seep Sedime ts (mg/kg-day) | Inge tio f Stream Sediments (mg/kg-day) | Inge tio of Surface W te (mg/kg day) | Ingestio f Seep Water (mg/kg-day) | Inhalation f Airborne Particulate (mg/kg-day) | Dermal Absorption f Su face Soil (mg/kg-day) | Dermal Absorptio f S bs rfac Soil (mg/kg day) | Dermal Absorpti f P nd Sedime t (mg/kg-day) | Dermal Absorptio f Se p Sedime ts (mg/kg-day) | De mal Absorp io f Stre m Sed n e (mg/kg-day) | De mal Absorptio f S rface W te (mg/kg day) | De mal Abso p f Se p W te (n g/kg day) | Ex nal Rad io Exposure (y pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | --- | - | | | | NA | NA | | - | | | | | NA |
| Al minum | NA | - | --- | | --- | | - | NA | NA | | | | | | | NA |
| Antimony | NA | -- | - | --- | --- | | - | NA | NA | - | | | | | | NA |
| Aroclor-1254 | 1 4E-09 | --- | --- | --- | -- | | | 9 4E-12 | 1 1E-08 | | | | | | | NA |
| Barium | NA | | --- | --- | --- | --- | --- | NA | NA | | -- | | | | | NA |
| Benzo(a)anthracene | 4 8E-09 | | --- | --- | - | --- | - | 4 3E-11 | NA | | | | | | | NA |
| Benzo(a)pyrene | 3 6E-09 | | --- | --- | --- | | -- | 4 0E-11 | NA | | | | | | | NA |
| Benzo(b)fluor nthe | 4 8E-09 | -- | --- | --- | --- | --- | --- | 4 7E-11 | NA | | | | | | | NA |
| Beryllium | NA | | --- | --- | -- | --- | --- | NA | NA | | | --- | | | | NA |
| Cadmium | NA | | --- | --- | | --- | -- | NA | NA | | | | | | | NA |
| Copper | 1 2E-07 | - | --- | --- | --- | --- | --- | 4 2E-13 | NA | | | --- | | | | NA |
| Dibenzo( h)anthracene | 2 2E-09 | -- | --- | --- | --- | - | -- | 8 7E-12 | NA | | | - | | | | NA |
| 1,1 Dichloroethene | NA | -- | --- | --- | --- | --- | --- | NA | NA | - | | - | | | | NA |
| 1 2 Dichloroethene | NA | | --- | --- | --- | --- | --- | NA | NA | | | | | | | NA |
| Fluoranthene | 4 2E-09 | --- | | --- | --- | --- | | 1 2E-10 | NA | | | -- | | | | NA |
| Indeno(1,2,3-cd)pyrene | 6 0E-09 | | | - | | | | 2.9E-11 | NA | | | | | | | NA |
| I h m | NA | | | | | | | NA | NA | | | | | | | NA |
| M nganese | NA | | | -- | - | -- | -- | NA | NA | | | | | | | NA |
| M rc ry | 5 3E 10 | | | | | - | | 1 8E-14 | NA | | | | | | | NA |
| Molybde m | NA | | | | | - | - | NA | NA | | | | | | | NA |
| N kel | NA | | | | | | - | NA | NA | | | | | | | NA |
| Py | 3 7E-0 | | | | | | | 1 1E 10 | NA | | | | | - | | NA |
| S 1 | 7 E-09 | | | | | | | 1 4E-16 | NA | | | - | | | | NA |
| Stru | NA | | | | | | -- | NA | NA | | | | | | | NA |
| T achlo e h | NA | | | | | | | NA | NA | | | | | | | NA |
| T hloro he | NA | | | | | | | NA | NA | | | - | | | | NA |
| V nadium | NA | | | -- | -- | | | NA | NA | | | | | | | NA |
| Zinc | NA | --- | - | --- | -- | --- | | NA | NA | - | | | | | | NA |
| Americium 241 | NA | - | --- | --- | --- | --- | --- | 6.9E-05 | NA | | - | --- | | - | | NA |
| Pl tonium 239/240 | NA | --- | --- | - | | --- | --- | 2.4E-04 | NA | | | --- | - | | | NA |
| Radium 226 | NA | - | -- | --- | --- | --- | - | NA | NA | - | - | | | | | NA |
| Uranium 233/234 | 7.5E+01 | | | - | - | - | --- | 2 9E-01 | NA | | | -- | | | | J 4F+00 |
| Uranium 235 | 2.1E+01 | | --- | --- | -- | -- | --- | 6 9E-02 | NA | - | | - | | | | 9 8E 01 |
| Uranium 238 | 6 4E+02 | --- | --- | --- | --- | --- | --- | 3 9E+00 | NA | | --- | -- | | | | 2 9E+01 |

N t Radi nucl de intak re in units f pCi
--- - not an pplicabl pathw y
NA not COC f this medium r n toxicity factor i vail bl

## Table 6 39
## Ecological Worker CT Carcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg day) | Ingestion of Subsurface Soil (mg/kg day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg day) | Ingestion of Seep Water (mg/kg day) | Inhalation of Airborne Particulate (mg/kg day) | Dermal Absorption of Surface Soil (mg/kg day) | Dermal Absorption of Subsurface Soil (mg/kg day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg day) | Dermal Absorption of Stream Sediment (mg/kg day) | Dermal Absorption of Surface Water (mg/kg day) | Dermal Absorption of Seep Water (mg/kg day) | External Irradiation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | --- | NA | | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | --- | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | | 6.9E-08 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 8.3E-10 | - | --- | NA | | | | 1.7E-12 | 2.8E-09 | | | NA | | | | NA |
| Barium | NA | --- | - | NA | --- | --- | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 2.9E-09 | | --- | NA | --- | | --- | 8.0E-12 | NA | | | NA | | | - | NA |
| Benzo(a)pyrene | 2.2E-09 | - | --- | NA | | | - | 7.4E-12 | NA | - | | NA | | | | NA |
| Benzo(b)fluoranthene | 3.0E-09 | - | --- | NA | --- | | | 8.7E-12 | NA | | | NA | | | | NA |
| Beryllium | NA | --- | --- | 2.3E-09 | --- | --- | --- | NA | NA | | | NA | | | | NA |
| Cadmium | NA | - | --- | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| Copper | 7.4E-08 | | --- | NA | --- | --- | --- | 7.8E-14 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 1.4E-09 | --- | --- | NA | --- | | | 1.6E-12 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | --- | --- | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | --- | --- | NA | | --- | --- | NA | NA | - | | NA | | | --- | NA |
| Fluoranthene | 2.6E-09 | --- | --- | NA | - | --- | --- | 2.2E-11 | NA | - | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 3.7E-09 | --- | --- | NA | --- | --- | --- | 5.3E-12 | NA | | - | NA | | | | NA |
| Lithium | NA | --- | | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| Manganese | NA | - | | NA | --- | - | --- | NA | NA | | | NA | | | | NA |
| Mercury | 3.2E-10 | | | NA | --- | | - | 3.3E-15 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | NA | | | --- | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | | --- | NA | NA | | | NA | | | | NA |
| Pyrene | 2.3E-09 | | | NA | | | - | 2.0E-11 | NA | | --- | NA | | | | NA |
| S l | 4.3E-09 | | | NA | | --- | - | 2.7E-17 | NA | | --- | NA | | | | NA |
| n | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T acl h | NA | | | NA | | - | | NA | NA | | | NA | | | | NA |
| T hlo e h | NA | | | NA | | --- | --- | NA | NA | | | NA | | - | | NA |
| Vanadium | NA | | | NA | | --- | | NA | NA | | - | NA | - | | | NA |
| Zinc | NA | | --- | 1.9E-07 | | --- | --- | NA | NA | | - | NA | | | | NA |
| Americium 241 | NA | | - | NA | --- | --- | --- | 1.3E-05 | NA | | - | NA | | | - | NA |
| Plutonium 239/240 | NA | --- | --- | NA | --- | --- | --- | 4.4E-06 | NA | - | - | NA | --- | | - | NA |
| Radium 226 | NA | --- | --- | NA | --- | --- | --- | NA | NA | --- | --- | NA | | | - | NA |
| Uranium 233/234 | 4.6E+01 | --- | --- | 6.8E+00 | --- | --- | --- | 5.4E-02 | NA | --- | --- | NA | | - | | 1.1E 00 |
| Uranium 235 | 1.3E+01 | --- | --- | 5.3E-01 | - | --- | --- | 1.3E-02 | NA | --- | --- | NA | --- | --- | | 3.JE 01 |
| Uranium 238 | 3.9E+02 | --- | --- | 5.8E+00 | --- | --- | --- | 7.2E-01 | NA | --- | --- | NA | | | | 9.8E 00 |

Note Radionuclide intakes are in units of pCi

--- = not an applicable pathway

NA not a COC for this medium or no toxicity factor available

**Table 6-40**
**Office Worker CT Carcinogenic Chemical Intakes for AOC1**

| hemk le of u ce | Inge tio f Su face Soil (mg/kg day) | Inge tio of Subs rface Soil (mg/kg lay) | Inge tion of Pond Sediments (mg/kg day) | Inge tio f Seep Sediments (mg/kg lay) | Ingestio of Stream Sedime ts (mg/kg day) | Ingestio f Surface W te (mg/kg day) | Ingestio f Seep W ter (mg/kg day) | Inhalation of Airborne P rtic l te (mg/kg day) | Dermal Absorption f Su face S l (mg/kg day) | Dermal Absorptio of Subs rface S l (mg/kg day) | Dermal Absorptio f Pond Sedime (mg/kg lay) | Dermal Absorptio of Seep Sed me (mg/kg day) | Dermal Absorptio f S re Sed e (mg/kg lay) | Dermal Absorptio f Surface W te (mg/k l y) | De mal Absorptio f Seep W (mg/kg day | Ex rnal Ra i n (yr pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Aroclor-1254 | 6.8E-10 | | | | | | | 7 1E-12 | 6.8E-09 | | | NA | | | | NA |
| Barium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 2.4E-09 | | | | | | | 3.3E-11 | NA | | | NA | | | | NA |
| Benzo( )pyrene | 1.8E-09 | | | | | | | 3 0E-11 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 2.4E-09 | | | | | | | 3 6E-11 | NA | | | NA | | | | NA |
| Beryllium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Cadm um | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Copper | 6 0E-08 | | | | | | | 3 2E-13 | NA | | | NA | | | | NA |
| Dibenzo( ,h)anthracene | 1 1E-09 | | | | | | | 6.6E-12 | NA | | | NA | | | | NA |
| 1,1 Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Fluoranthene | 2.1E-09 | | | | | | | 9 1E-11 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 3.0E-09 | | | | | | | 2.2E-11 | NA | | | NA | | | | NA |
| Lithium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | | | | | NA | NA | | | NA | | | | NA |
| M rc ry | 2 6E-10 | | | | | | | 1 4E-14 | NA | | | NA | | | | NA |
| Molybde m | NA | | | | | | | NA | NA | | | NA | | | | NA |
| N kel | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Pyre | 1 9E-09 | | | | | | | 8 1E-11 | NA | | | NA | | | | NA |
| Sil | 3 5E-09 | | | | | | | 1 1E-16 | NA | | | NA | | | | NA |
| S m | NA | | | | | | | NA | NA | | | NA | | | | NA |
| T achloro h | NA | | | | | | | NA | NA | | | NA | | | | NA |
| T hl roe h ne | NA | | | | | | | NA | NA | | | NA | | | | NA |
| V nadi m | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Z nc | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | | | | | 5.3E-05 | NA | | | NA | | | | NA |
| Pl tonium 239/240 | NA | | | | | | | 1.8E-04 | NA | | | NA | | | | NA |
| Radium 226 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Uranium-233/234 | 3 8E+01 | | | | | | | 2.2E-01 | NA | | | NA | | | | 3 4E+00 |
| Uranium 235 | 1 1E+01 | | | | | | | 5.2E-02 | NA | | | NA | | | | 9 8E-01 |
| Uranium 238 | 3 2E+02 | | | | | | | 3.0E+00 | NA | | | NA | | | | 2 9E+01 |

Note Radionucl de intak are in units f pCi
-- = not an applicabl pathway
NA = not a COC for this medium r n toxicity factor is availabl

## Table 6-41
## Open Space User CT Carcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | | 2.5E-08 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 3.0E-10 | | | NA | | | | 2.0E-13 | 3.7E-10 | | | NA | | | | NA |
| Barium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 1.1E-09 | | | NA | | | | 9.3E-13 | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 8.0E-10 | | | NA | | | | 8.5E-13 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 1.1E-09 | | | NA | | | | 1.0E-12 | NA | | | NA | | | | NA |
| Beryllium | NA | | | 8.3E-10 | | | | NA | NA | | | NA | | | | NA |
| Cadmium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Copper | 2.7E-08 | | | NA | | | | 9.1E-15 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 4.9E-10 | | | NA | | | | 1.9E-13 | NA | | | NA | | | | NA |
| 1,1 Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| 1,2 Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Fluoranthene | 9.3E-10 | | | NA | | | | 2.6E-12 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.3E-09 | | | NA | | | | 6.1E-13 | NA | | | NA | | | | NA |
| Lithium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Mercury | 1.2E-10 | | | NA | | | | 3.8E-16 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Pyrene | [illegible] | | | NA | | | | 2.3E-12 | NA | | | NA | | | | NA |
| [illegible] | 1.6E-09 | | | NA | | | | 3.1E-18 | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | 6.8E-08 | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | NA | | | | 1.5E-06 | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | NA | | | | 5.1E-06 | NA | | | NA | | | | NA |
| Radium 226 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium-233/234 | 1.7E+01 | | | 2.5E+00 | | | | 6.2E-03 | NA | | | NA | | | | 6.9E-01 |
| Uranium 235 | 4.8E+00 | | | 1.9E-01 | | | | 1.5E-03 | NA | | | NA | | | | 2.0E-01 |
| Uranium 238 | 1.4E+02 | | | 2.1E+00 | | | | 8.4E-02 | NA | | | NA | | | | 5.9E+00 |

Note Radionuclide intakes are in units of pCi
-- not an applicable pathway
NA not a COC for this medium or no toxicity factor is available

## Table 6-42
### Construction Worker RME Carcinogenic Chemical Intakes for AOC2

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (year per pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA |
| Aluminum | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA |
| Antimony | NA | 3.84E-08 | — | — | — | — | — | NA | NA | NA | — | NA | — | — | — | NA |
| Aroclor-1254 | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA |
| Barium | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA |
| Benzo(a)anthracene | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | — | NA |
| Benzo(a)pyrene | 3.01E-09 | NA | — | — | — | — | — | 7.76E-14 | NA | NA | — | NA | — | — | | NA |
| Benzo(b)fluoranthene | 5.92E-11 | NA | — | — | — | — | — | 6.39E-15 | NA | NA | — | NA | — | — | | NA |
| Beryllium | NA | 5.23E-09 | — | — | — | — | — | NA | NA | NA | | NA | — | — | — | NA |
| Cadmium | NA | 1.01E-08 | — | — | — | — | — | NA | NA | 9.93E-10 | — | NA | — | | | NA |
| Copper | 1.46E-07 | 3.30E-07 | — | — | — | — | — | 1.53E-14 | NA | NA | — | NA | — | | | NA |
| Dibenzo(a,h)anthracene | 1.02E-10 | NA | — | — | — | — | — | 1.04E-14 | NA | NA | — | NA | — | | | NA |
| 1,1-Dichloroethene | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA |
| 1,2-Dichloroethene | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | — | | | NA |
| Fluoranthene | 3.59E-10 | NA | — | — | — | — | — | 7.54E-14 | NA | NA | | NA | — | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.48E-10 | NA | — | — | — | — | — | 1.51E-14 | NA | NA | — | NA | — | | | NA |
| Lithium | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA |
| Manganese | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA |
| Mercury | 6.44E-10 | NA | — | — | — | — | — | 6.66E-19 | NA | NA | — | NA | | — | | NA |
| Molybdenum | NA | 1.78E-07 | | | — | — | | NA | NA | NA | — | NA | | — | | NA |
| Nickel | NA | 1.82E-07 | | | — | — | — | NA | NA | NA | — | NA | | | | NA |
| Pyrene | 4.31E-10 | NA | | | — | — | — | 8.93E-14 | NA | NA | | NA | | | | NA |
| Silver | 1.27E-08 | 3.44E-08 | | | | — | — | NA | NA | NA | | NA | | | | NA |
| Strontium | NA | NA | | | — | — | — | NA | NA | NA | — | NA | | | | NA |
| Tetrachloroethene | NA | NA | | | — | — | — | NA | NA | NA | — | NA | — | | — | NA |
| Trichloroethene | NA | NA | | — | — | — | — | NA | NA | NA | — | NA | — | | | NA |
| Vanadium | NA | NA | | | — | — | — | NA | NA | NA | — | NA | — | — | | NA |
| Zinc | NA | NA | | — | — | — | — | NA | NA | NA | — | NA | — | | | NA |
| Americium 241 | NA | NA | — | — | — | — | — | 4.23E-06 | NA | NA | — | NA | — | | | NA |
| Plutonium-239/240 | NA | NA | — | — | — | — | — | 1.41E-04 | NA | NA | | NA | | | | NA |
| Radium-226 | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| Uranium-233/234 | 7.47E+01 | 4.82E+01 | — | — | — | — | — | 1.73E-02 | NA | NA | — | NA | — | — | — | 1.56E-01 |
| Uranium-235 | 5.04E+00 | 8.50E+00 | — | — | — | — | — | 2.36E-03 | NA | NA | — | NA | — | | | 1.05E-02 |
| Uranium-238 | 1.97E+02 | 1.31E+02 | — | — | — | — | — | 1.02E-01 | NA | NA | — | NA | — | — | | 4.10E-01 |

Note Radionuclide intake are in units of pCi

— = not an applicabl pathway

NA – not a COC for this medium r no toxicity factor is available

## Table 6-43
### Current Worker RME Carcinogenic Chemical Intake for AOC2

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure ([illegible]) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | -- | -- | -- | - | -- | NA | NA | | | | | | | NA |
| Aluminum | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | | | | | NA |
| Antimony | NA | -- | -- | -- | | -- | | NA | NA | | | | | | | NA |
| Aroclor 1254 | NA | -- | -- | -- | | -- | | NA | NA | | | | | | | NA |
| Barium | NA | -- | -- | | | | | NA | NA | | | | | | | NA |
| Benz(a)anthracene | NA | -- | -- | -- | -- | | | NA | NA | | | | | | | NA |
| Benzo(a)pyrene | 6.5E-08 | -- | -- | -- | -- | - | -- | 9.6E-12 | NA | - | | | | | | NA |
| Benzo(b)fluoranthene | 1.3E-09 | -- | -- | -- | -- | -- | -- | 7.9E-13 | NA | -- | | | | | | NA |
| Beryllium | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | -- | | | -- | NA |
| Cadmium | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | -- | | - | | NA |
| Copper | 3.2E-06 | -- | -- | -- | -- | -- | -- | 1.9E-12 | NA | -- | | | | | -- | NA |
| Dibenzo(a,h)anthracene | 2.2E-09 | -- | -- | -- | -- | -- | -- | 1.3E-12 | NA | -- | -- | - | | | -- | NA |
| 1,1-Dichloroethene | NA | -- | -- | -- | -- | -- | -- | NA | NA | -- | -- | -- | - | | | NA |
| 1,2-Dichloroethene | NA | -- | -- | -- | -- | -- | -- | NA | NA | -- | | -- | | | | NA |
| Fluoranthene | 7.8E-09 | -- | -- | -- | -- | -- | -- | 9.3E-12 | NA | - | - | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 3.3E-09 | | -- | -- | -- | -- | -- | 1.9E-12 | NA | -- | -- | -- | -- | | | NA |
| Lithium | NA | -- | -- | -- | -- | -- | -- | NA | NA | - | -- | -- | | | | NA |
| Manganese | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | | | | | NA |
| Mercury | 1.4E-08 | - | | -- | -- | | -- | 8.2E-17 | NA | | - | | | | | NA |
| Molybdenum | NA | | -- | -- | | | -- | NA | NA | - | | - | | | | NA |
| Nickel | NA | | | - | | | - | NA | NA | - | - | | | | | NA |
| Pyrene | 9.4E-09 | | | -- | - | - | -- | 1.1E-11 | NA | | | - | | | | NA |
| Silver | 2.8E-07 | | | | | | | NA | NA | | | | | | | NA |
| Strontium | NA | | | | | - | | NA | NA | - | | | | | | NA |
| Tetrachloroethene | NA | | | | -- | | | NA | NA | | | | | | | NA |
| Trichloroethene | NA | | | -- | -- | | | NA | NA | - | | | | | | NA |
| Vanadium | NA | - | | - | -- | | | NA | NA | | | | | | | NA |
| Zinc | NA | -- | - | -- | -- | -- | -- | NA | NA | -- | - | -- | | - | - | NA |
| Americium 241 | NA | -- | -- | -- | -- | - | - | 5.2E-03 | NA | -- | -- | -- | | | | NA |
| Plutonium 239/240 | NA | -- | -- | -- | -- | -- | -- | 1.7E-02 | NA | -- | -- | -- | | | | NA |
| Radium-226 | NA | -- | -- | -- | -- | -- | -- | NA | NA | -- | -- | -- | | -- | -- | NA |
| Uranium 233/234 | 1.6E+03 | -- | -- | -- | -- | -- | -- | 2.1E+00 | NA | -- | -- | -- | - | | -- | 2.2E-01 |
| Uranium 235 | 1.1E+02 | -- | -- | -- | -- | -- | -- | 2.9E-01 | NA | -- | -- | -- | - | - | -- | 1.5E-00 |
| Uranium 238 | 4.3E+03 | -- | -- | -- | -- | -- | -- | 1.8E+01 | NA | -- | -- | -- | -- | -- | -- | 5.7E-01 |

Note Radionuclide intakes are in units of pCi

-- not an applicable pathway

NA - not a COC for this medium or no toxicity factor is available

**Table 6-44**
**Ecological Worker RME Carcinogenic Chemical Intakes for AOC2**

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (yrs per pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | - | — | — | NA |
| Aluminum | NA | — | — | NA | — | — | — | NA | NA | - | — | NA | - | | — | NA |
| Antimony | NA | — | — | 2.1E-07 | — | — | | NA | NA | | — | NA | | — | — | NA |
| Aroclor-1254 | NA | — | — | NA | — | — | — | NA | NA | — | - | NA | — | — | - | NA |
| Barium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | | NA |
| Benzo(a)anthracene | NA | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 3.6E-09 | — | — | NA | — | — | — | 4.2E-13 | NA | - | — | NA | | | - | NA |
| Benzo(b)fluoranthene | 7.1E-11 | — | — | NA | — | — | — | 3.5E-14 | NA | — | — | NA | — | — | | NA |
| Beryllium | NA | — | — | 7.2E-09 | — | — | — | NA | NA | - | | NA | — | - | - | NA |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | — | | NA | - | — | — | NA |
| Copper | 1.7E-07 | — | — | NA | — | — | — | 8.3E-14 | NA | — | — | NA | | — | - | NA |
| Dibenzo(a,h)anthracene | 1.2E-10 | — | — | NA | — | — | — | 5.6E-14 | NA | — | | NA | | | | NA |
| 1,1 Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | - | | | NA |
| 1,2 Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | - | - | — | NA |
| Fluoranthene | 4.3E-10 | — | — | NA | — | — | — | 4.1E-13 | NA | — | | NA | - | — | | NA |
| Indeno(1,2,3-cd)pyrene | 1.8E-10 | — | — | NA | — | — | — | 8.2E-14 | NA | - | - | NA | | - | | NA |
| Lithium | NA | — | — | NA | — | - | - | NA | NA | — | | NA | - | | | NA |
| Manganese | NA | — | — | NA | — | - | — | NA | NA | | — | NA | | | | NA |
| Mercury | 7.7E-10 | — | — | NA | — | — | — | 3.6E-18 | NA | - | — | NA | | — | | NA |
| Molybdenum | NA | — | - | NA | — | — | — | NA | NA | | — | NA | | — | | NA |
| Nickel | NA | - | — | NA | — | — | — | NA | NA | | - | NA | | - | | NA |
| Pyrene | 5.2E-10 | - | | NA | — | — | - | 4.8E-13 | NA | - | — | NA | — | — | | NA |
| Silver | 1.5E-08 | | | NA | — | — | — | NA | NA | — | - | NA | — | | - | NA |
| Strontium | NA | | — | NA | — | — | — | NA | NA | — | — | NA | — | — | - | NA |
| Tetrachloroethene | NA | - | — | NA | — | — | — | NA | NA | — | — | NA | — | — | - | NA |
| Trichloroethene | NA | - | | NA | — | — | — | NA | NA | — | — | NA | — | — | | NA |
| Vanadium | NA | | | NA | — | — | — | NA | NA | | — | NA | — | - | | NA |
| Zinc | NA | — | — | 1.0E-05 | — | — | — | NA | NA | - | — | NA | — | | — | NA |
| Americium 241 | NA | — | — | NA | — | — | — | 2.3E-04 | NA | - | — | NA | — | | | NA |
| Plutonium-239/240 | NA | — | — | NA | — | — | — | 7.6E-04 | NA | | — | NA | — | | — | NA |
| Radium 226 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | | | NA |
| Uranium-233/234 | 8.9E+01 | — | — | 3.4E+01 | — | — | — | 9.4E-02 | NA | — | — | NA | - | — | | 7.8E-01 |
| Uranium 235 | 6.0E+00 | — | — | 2.2E+00 | — | — | — | 1.3E-02 | NA | — | — | NA | — | — | — | 5.3E-02 |
| Uranium 238 | 2.4E+02 | — | — | 6.4E+01 | — | — | — | 5.5E-01 | NA | — | — | NA | - | — | - | 2.1E+00 |

Note Radionuclide intake are in units of pCi
— - not an applicable pathway
"NA - not a COC for this medium or no toxicity factor is available

## Table 6-45
### Office Worker RME Carcinogenic Chemical Intakes for AOC2

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | — | — | | — | NA | NA | | — | NA | | — | - | NA |
| Aluminum | NA | | — | — | — | - | — | NA | NA | — | | NA | | - | | NA |
| Antimony | NA | | — | — | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | | — | | — | | | NA | NA | | | NA | | | | NA |
| Barium | NA | — | — | — | — | - | — | NA | NA | — | — | NA | | | | NA |
| Benzo(a)anthracene | NA | | — | — | — | — | — | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 6.5E-08 | | — | — | — | — | - | 9.6E-12 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 1.3E-09 | — | — | — | — | — | | 7.9E-13 | NA | | | NA | | | | NA |
| Beryllium | NA | | — | — | — | | | NA | NA | | | NA | | | | NA |
| Cadmium | NA | - | — | — | — | | — | NA | NA | | | NA | | | | NA |
| Copper | 3.2E-06 | — | — | — | — | - | | 1.9E-12 | NA | | — | NA | | | | NA |
| Dibenzo(a,h)anthracene | 2.2E-09 | — | — | — | — | - | — | 1.3E-12 | NA | | — | NA | | - | - | NA |
| 1,1-Dichloroethene | NA | — | — | — | — | — | - | NA | NA | - | — | NA | | | | NA |
| 1,2-Dichloroethene | NA | — | — | — | — | — | — | NA | NA | | — | NA | | | | NA |
| Fluoranthene | 7.8E-09 | — | — | — | — | — | — | 9.3E-12 | NA | | - | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 3.2E-09 | — | — | — | — | — | — | 1.9E-12 | NA | | - | NA | | | | NA |
| Lithium | NA | — | — | — | — | — | — | NA | NA | — | | NA | | | | NA |
| Manganese | NA | — | — | — | — | - | — | NA | NA | — | | NA | | | - | NA |
| Mercury | 1.4E-08 | | — | — | | | | 8.2E-17 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | - | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | — | — | — | - | — | NA | NA | — | — | NA | | — | | NA |
| Pyrene | 9.4E-09 | | - | — | — | | — | 1.1E-11 | NA | | - | NA | - | - | — | NA |
| Silver | 2.8E-07 | | - | — | — | — | - | NA | NA | | - | NA | - | | | NA |
| Strontium | NA | | - | — | — | — | — | NA | NA | — | — | NA | - | - | - | NA |
| Tetrachloroethene | NA | | | - | — | — | | NA | NA | | — | NA | - | — | | NA |
| Trichloroethene | NA | | — | — | — | | — | NA | NA | - | — | NA | | | - | NA |
| Vanadium | NA | | — | — | — | — | — | NA | NA | — | | NA | | — | | NA |
| Zinc | NA | - | — | — | — | — | — | NA | NA | — | — | NA | | - | — | NA |
| Americium-241 | NA | — | — | — | — | — | — | 5.2E-03 | NA | — | — | NA | - | | — | NA |
| Plutonium-239/240 | NA | — | — | — | — | — | — | 1.7E-02 | NA | — | — | NA | — | | - | NA |
| Radium 226 | NA | — | — | — | — | — | — | NA | NA | — | — | NA | | — | - | NA |
| Uranium-233/234 | 1.6E+03 | - | — | — | — | — | — | 2.1E+00 | NA | — | — | NA | — | - | - | 2.2E-01 |
| Uranium 235 | 1.1E+02 | — | — | — | — | — | — | 2.9E-01 | NA | — | — | NA | | | | 1.5E+00 |
| Uranium 238 | 4.3E+03 | - | — | — | — | — | — | 1.8E+01 | NA | — | — | NA | - | | | 5.7E [illegible] |

Note: Radionuclide intakes are in units of pCi
— = not an applicable pathway
NA = not a COC for this medium or no toxicity factor is available

# NOTICE:

**"BEST AVAILABLE COPY"**

## PORTIONS OF THE FOLLOWING DOCUMENT ARE ILLEGIBLE

## Table 6-46
## Open Space User RME Carcinogenic Chemical Intakes for AOC2

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (yrs per pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Aluminum | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Antimony | NA | — | — | 3.7E-07 | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Aroclor-1254 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Barium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Benzo(a)anthracene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Benzo(a)pyrene | 6.3E-09 | — | — | NA | — | — | — | 1.2E-12 | NA | — | — | NA | — | — | — | NA |
| Benzo(b)fluoranthene | 1 2E-10 | — | — | NA | — | — | — | 1.0E-13 | NA | — | — | NA | — | — | — | NA |
| Beryllium | NA | — | — | 1.[illegible]E-09 | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Copper | 3 0E-07 | — | — | NA | — | — | — | 2.4E-13 | NA | — | — | NA | — | — | — | NA |
| Dibenzo(a,h)anthracene | 2.1E-10 | — | — | NA | — | — | — | 1 6E-13 | NA | — | — | NA | — | — | — | NA |
| 1,1 Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| 1,2 Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Fluoranthene | 7 5E-10 | — | — | NA | — | — | — | 1.2E-12 | NA | — | — | NA | — | — | — | NA |
| Indeno(1,2,3-cd)pyrene | 3.1E-10 | — | — | NA | — | — | — | 2.4E-13 | NA | — | — | NA | — | — | — | NA |
| Lithium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Manganese | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Mercury | 1 3E-09 | — | — | NA | — | — | — | 1 0E-17 | NA | — | — | NA | — | — | — | NA |
| Molybdenum | NA | | | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Nickel | NA | | - | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA |
| Pyrene | 9 0E 10 | | | NA | — | — | — | 1 4E-12 | NA | - | | NA | | | | NA |
| Selenium | 2 7E-08 | | | NA | — | | — | NA | NA | | — | NA | | | | NA |
| Strontium | NA | | | NA | — | | | NA | NA | | | NA | | | | NA |
| Tetrachloroethene | NA | | — | NA | — | | — | NA | NA | | | NA | | | | NA |
| Trichloroethene | NA | — | | NA | — | - | — | NA | NA | — | — | NA | | — | | NA |
| Vanadium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | — | | NA |
| Zinc | NA | — | — | 1.[illegible]E-05 | — | — | — | NA | NA | — | — | NA | — | — | - | NA |
| Americium 241 | NA | — | — | NA | — | — | — | 6.6E-04 | NA | — | — | NA | - | — | — | NA |
| Plutonium 239/240 | NA | — | — | NA | — | — | — | 2.2E-03 | NA | — | — | NA | — | — | — | NA |
| Radium 226 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | — | | NA |
| Uranium-233/234 | 1 6E+02 | — | — | 6.0E+01 | — | — | — | 2.7E-01 | NA | — | — | NA | — | - | — | NA |
| Uranium-235 | 1 1E+01 | — | — | 3.[illegible]E+00 | — | — | — | 3.7E-02 | NA | — | — | NA | - | | | 3 1E+00 |
| Uranium-238 | 4 1E+02 | — | — | 1 1E+02 | — | — | — | 1.6E+00 | NA | — | — | NA | — | - | — | 2 1E-01 |
| | | | | | | | | | | | | | — | — | — | 8 2E+00 |

Note Radionuclide intakes are in units of pCi
— = not an applicable pathway
"NA = not a COC for this medium or no toxicity factor is available

**Table 6-47**
**Construction Worker CT Carcinogenic Chemical Intakes for AOC2**

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Rad Exposure (yr per pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | - | - | | NA |
| Aluminum | NA | NA | — | — | — | | - | NA | NA | NA | | NA | | | — | NA |
| Antimony | NA | 6.83E-09 | — | — | | . | — | NA | NA | NA | | NA | | | | NA |
| Aroclor 1254 | NA | NA | — | — | — | | — | NA | NA | NA | | NA | | | — | NA |
| Barium | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| Benzo(a)anthracene | NA | NA | — | — | | | . | NA | NA | NA | | NA | | | | NA |
| Benzo(a)pyrene | 5.36E-10 | NA | — | — | — | | — | 6.24E-14 | NA | NA | | NA | | | | NA |
| Benzo(b)fluoranthene | 1.05E-11 | NA | — | — | — | | . | 5.13E-15 | NA | NA | | NA | | | | NA |
| Beryllium | NA | 9.32E-10 | — | — | — | — | — | NA | NA | NA | | NA | | — | — | NA |
| Cadmium | NA | 1.81E-09 | — | — | — | . | — | NA | NA | NA | — | NA | | — | . | NA |
| Copper | 2.60E-08 | 5.87E-08 | — | — | — | — | — | NA | NA | 1.79E-10 | | NA | | | — | NA |
| Dibenzo(a,h)anthracene | 1.82E-11 | NA | — | — | — | — | — | 1.22E-14 | NA | NA | — | NA | | | | NA |
| 1,1 Dichloroethene | NA | NA | — | — | — | — | — | 8.34E-15 | NA | NA | . | NA | | | — | NA |
| 1,2 Dichloroethene | NA | NA | — | — | — | — | — | NA | NA | NA | . | NA | | | | NA |
| Fluoranthene | 6.39E-11 | NA | — | — | — | — | — | NA | NA | NA | | NA | | — | . | NA |
| Indeno(1,2,3-cd)pyrene | 2.64E-11 | NA | — | — | — | . | — | 6.06E-14 | NA | NA | — | NA | | | | NA |
| Lithium | NA | NA | — | — | — | | | 1.21E-14 | NA | NA | | NA | | | | NA |
| Manganese | NA | NA | | — | | | | NA | NA | NA | | NA | | | | NA |
| Mercury | 1.15E-10 | NA | — | — | — | . | | NA | NA | NA | | NA | | | — | NA |
| Molybdenum | NA | 3.17E-08 | | | — | | | 5.35E-19 | NA | NA | | NA | | | | NA |
| Nickel | NA | 3.24E-08 | | | . | . | . | NA | NA | NA | — | NA | | | . | NA |
| Pyrene | 7.68E-11 | NA | | | | | | NA | NA | NA | — | NA | | | . | NA |
| Silver | 2.27E-09 | 6.12E-09 | | | — | | | 7.17E-14 | NA | NA | . | NA | . | | — | NA |
| Strontium | NA | NA | — | — | — | | — | NA | NA | NA | | NA | | | | NA |
| Tetrachloroethene | NA | NA | | | | | | NA | NA | NA | — | NA | | . | — | NA |
| Trichloroethene | NA | NA | — | — | — | | | NA | NA | NA | — | NA | . | . | — | NA |
| Vanadium | NA | NA | | — | . | | — | NA | NA | NA | | NA | — | — | . | NA |
| Zinc | NA | NA | — | — | — | . | — | NA | NA | NA | . | NA | | — | | NA |
| Americium 241 | NA | NA | — | — | — | . | — | NA | NA | NA | — | NA | — | — | — | NA |
| Plutonium 239/240 | NA | NA | — | — | — | — | — | 3.40E-05 | NA | NA | — | NA | | . | | NA |
| Radium-226 | NA | NA | — | — | — | — | — | 1.13E-04 | NA | NA | — | NA | — | | — | NA |
| Uranium 233/234 | 1.33E+01 | 8.50E+00 | — | — | — | — | — | NA | NA | NA | — | NA | — | | — | 1.25E-01 |
| Uranium 235 | 8.98E-01 | 1.51E+00 | — | — | — | — | — | 1.30E-02 | NA | NA | — | NA | — | — | — | 8.40E-03 |
| Uranium 238 | 3.51E+01 | 2.33E+01 | — | — | — | — | — | 1.90E-08 | NA | NA | — | NA | — | — | — | 3.28E-01 |

Note: Radionuclide intakes are in units of pCi.
— = not an applicable pathway
NA = not a COC for this medium or no toxicity factor is available.

**Table 6-48**
**Current Worker CT Carcinogenic Chemical Intakes for AOC2**

| Chem l of Concern | I ge f S rface Soil (mg/kg-day) | Ingestio f Subs rface Soil (mg/kg day) | Ingesti of Po d Sedimei ts (mg/kg-day) | Inge tio of Seep Sedimei ts (mg/kg-day) | Inge f Stre m Sediments (mg/kg-day) | Inge tio f Su face W te (mg/kg day) | I g tio f Seep Water (mg/kg-day) | I halatioi of A rborne Partic lates (mg/kg-day) | Dermal Absorptio f Surface Soil (mg/kg-day) | Dermal Abso pt f S bs face Soil (mg/kg day) | Dermal Absorptio f Pond Sediments (mg/kg-day) | De mal Absorptio f Seep Sedim ts (mg/kg-day) | De al Absorptio f S re Sedimei (mg/kg-day) | De al Absi rptio f S f c W te (mg/kg day) | D i al Abso p Se p W te (mg/kg day) | F al Rad Exposure (y l pl i/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | -- | -- | -- | -- | -- | NA | NA | -- | -- | -- | | | | NA |
| Aluminum | NA | | -- | -- | | | -- | NA | NA | -- | -- | | | | | NA |
| Antimony | NA | | -- | | | | | NA | NA | -- | | | | | | NA |
| Aroclor 1254 | NA | -- | -- | -- | | | -- | NA | NA | | | | | | | NA |
| Barium | NA | | | | -- | -- | -- | NA | NA | | | -- | | | | NA |
| Benzo(a)anthracene | NA | -- | | -- | | -- | -- | NA | NA | | | | | | | NA |
| Benzo(a)pyrene | 1 6E-09 | | | | | | | 1 2E-12 | NA | | | | | | | NA |
| Benzo(b)fluoranthene | 3 2E 11 | | | | -- | | | 1 0E 13 | NA | | | | | | | NA |
| Beryllium | NA | | -- | -- | | -- | -- | NA | NA | | | | | | | NA |
| Cadm um | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | | | | | NA |
| C ppe | 8 0E-08 | -- | -- | -- | -- | -- | -- | 2 4E-13 | NA | | | | | | | NA |
| Dibenzo( ,h)anthracene | 5 6E-11 | | -- | -- | -- | -- | -- | 1 6E 13 | NA | | | | | | | NA |
| 1 1 Dichloroethene | NA | | | -- | -- | | | NA | NA | | | | | | | NA |
| 1 2 Dichloroethene | NA | -- | | -- | -- | | | NA | NA | | | | | | | NA |
| Fluora thene | 2.0E-10 | | | | | -- | -- | 1 2E-12 | NA | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 8 1E-11 | | -- | -- | -- | -- | | 2 4E 13 | NA | | | | | | | NA |
| I hi m | NA | -- | | -- | -- | | -- | NA | NA | | | | | | | NA |
| M nganese | NA | | | -- | -- | -- | | NA | NA | | | | | | | NA |
| M rc ry | 3 5E-10 | | | | | | | 1 0E-17 | NA | | | | | | | NA |
| M lybde m | NA | | | | | | | NA | NA | | | | | | | NA |
| N kel | NA | | | | | | | NA | NA | | | | | | | NA |
| I yre | 2 4E 1 | | | | | | | 1 4E-12 | NA | | | | | | | NA |
| | 7 )F | | | -- | -- | | -- | NA | NA | | | | | | | NA |
| | NA | | | | | | | NA | NA | | | | | | | NA |
| Γ | NA | | | | | | | NA | NA | | | | | | | NA |
| I he | NA | | | | | | | NA | NA | | | | | | | NA |
| ad u | NA | | | | | | | NA | NA | | | | | | | NA |
| Z | NA | | | | | | | NA | NA | | | | | | | NA |
| Am n i 241 | NA | | | | | | | 6 6E-04 | NA | | | | | | | NA |
| Pl toi m 239/240 | NA | | | | | -- | | 2 2E-03 | NA | | | | | | | NA |
| Radi m 226 | NA | | -- | -- | -- | -- | -- | NA | NA | | | | | | | NA |
| Uran m 233/234 | 4 1E+01 | | | | | | | 2 7E-01 | NA | | | | | | | 1 3E+00 |
| Uranium 235 | 2.8E+00 | -- | | -- | | -- | | 3 7E-02 | NA | | | | | | | 1 3E-01 |
| Urani m 238 | 1 1E+02 | -- | | -- | -- | | -- | 1 6E+00 | NA | | | | | | | 4 . E 00 |

Note Radio uclide take are nits of pC
not an pplicable pathw y
NA not COC fo thi med m no tox ty facto vailable

## Table 6-49
## Ecological Worker CT Carcinogenic Chemical Intakes for AOC2

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | | NA | | | | NA | NA | | | NA | | | | N |
| Antimony | NA | | -- | 5.9E-08 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Barium | NA | | | NA | -- | -- | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | - | -- | NA | | | -- | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 1.0E-09 | -- | -- | NA | -- | -- | - | 2.2E-13 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 2.0E-11 | -- | -- | NA | | -- | | 1.8E-14 | NA | | | NA | | | | NA |
| Beryllium | NA | | -- | 2.0E-09 | -- | | - | NA | NA | | | NA | | | | NA |
| Cadmium | NA | -- | - | NA | -- | | -- | NA | NA | | | NA | | | | NA |
| Copper | 4.9E-08 | -- | -- | NA | -- | -- | -- | 4.4E-14 | NA | - | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 3.4E-11 | -- | -- | NA | -- | -- | -- | 3.0E-14 | NA | - | -- | NA | | | | NA |
| 1,1-Dichloroethene | NA | - | | NA | -- | | -- | NA | NA | | | NA | -- | | | NA |
| 1,2-Dichloroethene | NA | - | -- | NA | - | -- | -- | NA | NA | | - | NA | | | | NA |
| Fluoranthene | 1.2E-10 | - | | NA | -- | -- | -- | 2.2E-13 | NA | | | NA | - | | | NA |
| Indeno(1,2,3-cd)pyrene | 5.0E-11 | -- | | NA | -- | | -- | 4.4E-14 | NA | | | NA | | | | NA |
| Lithium | NA | | -- | NA | - | - | -- | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | - | | | NA | NA | | | NA | | | | NA |
| Mercury | 2.2E-1 | | | NA | | | | 1.9E-18 | NA | | | NA | | | | NA |
| Molybdenum | NA | - | | NA | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Pyrene | 1.4E-1 | | | NA | | | | 2.6E-13 | NA | | | NA | | | | NA |
| Silver | 4.3E-09 | | | NA | | | - | NA | NA | | | NA | | | | NA |
| Strontium | NA | | | NA | | | | NA | NA | | -- | NA | | | | NA |
| Tetrachloroethene | NA | | | NA | | | | NA | NA | | - | NA | | | | NA |
| Trichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | - | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | - | NA |
| Zinc | NA | | | 2.8E-06 | -- | | -- | NA | NA | | | NA | | | - | NA |
| Americium 241 | NA | -- | -- | NA | - | | -- | 1.2E-04 | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | -- | NA | - | | -- | 4.1E-04 | NA | | | NA | | | | NA |
| Radium 226 | NA | | -- | NA | -- | -- | -- | NA | NA | -- | | NA | | | | NA |
| Uranium 233/234 | 2.5E+01 | -- | -- | 9.7E+00 | -- | | -- | 5.0E-02 | NA | | | NA | | | | 6.2E-01 |
| Uranium 235 | 1.7E+00 | -- | -- | 6.3E-01 | -- | -- | -- | 6.8E-03 | NA | -- | -- | NA | | | | 4.2E-02 |
| Uranium 238 | 6.6E+01 | | -- | 1.8E+01 | -- | -- | -- | 3.0E-01 | NA | | -- | NA | -- | | -- | 1.6E+00 |

Note: Radionuclide intakes are in units of pCi.
-- not an applicable pathway
NA not COC for this medium or no toxicity factor is available.

Table 6-50
Office Worker CT Carcinogenic Chemical Intakes for AOC2

| Chemicals f Concern | Inge tio f Surface Soil (mg/kg-day) | Inge ti f Subsurface Soil (mg/kg day) | Inge tio f Pond Sediments (mg/kg-day) | Ingestio f Se p Sedim ts (mg/kg-day) | Inge tio f Stre m Sediments (mg/kg-day) | Inge tio f Surface W te (mg/kg day) | Inge tio f Seep W ter (mg/kg-day) | I halation f Airborne Partic late (mg/kg-day) | De mal Absorpti f Surface Soil (mg/kg-day) | Dermal Absorption f Subsurface Soil (mg/kg day) | De mal Absorptio f P nd Sed ment (mg/kg-day) | Dermal Absorptio f Seep Sedimen (mg/kg-day) | De al Abso ptio f S r m Sed (mg/kg-day) | De mal Abs pti f rface W te (mg/kg day) | D rmal Abso p ti Se p W te (mg/kg-day) | T al I k Exposure (y pe pC i/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | | | | | NA |
| | | | | | | | | NA | NA | | | NA | | | | |
| Aluminum | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Aroclor-1254 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Barium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Benzo( )anthracene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Benzo( )pyrene | 8 2E-10 | | | | | | | 9.2E-13 | NA | | | NA | | | | NA |
| Benzo(b)fluora hene | 1 6E 11 | | | | | | | 7 6E-14 | NA | | | NA | | | | NA |
| Beryll m | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Cadm m | NA | | | | | | | NA | NA | | | NA | | | | NA |
| C pper | 4 0E-08 | | | | | | | 1 8E-13 | NA | | | NA | | | | NA |
| Dibenzo( ,h)anthracene | 2 8E-11 | | | | | | | 1 2E-13 | NA | | | NA | | | | NA |
| 1 1 Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| 1 2 Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Fluoranthene | 9 8E 11 | | | | | | | 8 9E-13 | NA | | | NA | | | | NA |
| Indeno(1 2,3-cd)pyrene | 4 1E 11 | | | | | | | 1 8E-13 | NA | | | NA | | | | NA |
| L thi m | NA | | | | | | | NA | NA | | | NA | | | | NA |
| M nganese | NA | | | | | | | NA | NA | | | NA | | | | NA |
| M rc ry | 1 8E 10 | | | | | | | 7 9E-18 | NA | | | NA | | | | NA |
| M lybde | NA | | | | | | | NA | NA | | | NA | | | | NA |
| N k l | NA | | | | | | | NA | NA | | | NA | | | | NA |
| I y | 1 2E | | | | | | | 1 1E-12 | NA | | | NA | | | | NA |
| | 3 5E 09 | | | | | | | NA | NA | | | NA | | | | NA |
| | NA | | | | | | | NA | NA | | | NA | | | | NA |
| I | NA | | | | | | | NA | NA | | | NA | | | | NA |
| I I | NA | | | | | | | NA | NA | | | NA | | | | NA |
| u | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Z | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Am i um 241 | NA | | | | | | | 5 0E-04 | NA | | | NA | | | | NA |
| Pl ton m 239/240 | NA | | | | | | | 1 7E-03 | NA | | | NA | | | | NA |
| Radi m 226 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Uran m 233/234 | 2.0E+01 | | | | | | | 2.0E-01 | NA | | | NA | | | | 1 9E+00 |
| Urani m 235 | 1 4E+00 | | | | | | | 2 8E-02 | NA | | | NA | | | | 1 3E-01 |
| Urani m 238 | 5 4E+01 | | | | | | | 1 2E+00 | NA | | | NA | | | | 4 [illegible]E 00 |

Note Radionuclide take re nits of pC
— not an pplicable p thw y
NA not COC fo thi med m no tox y facto va l ble

## Table 6-51
## Open Space User CT Carcinogenic Chemical Intakes for AOC2

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | -- | NA | -- | - | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | | NA | | - | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | - | 2.1E-08 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | | - | NA | | | | NA | NA | | | NA | | | | NA |
| Barium | NA | | | NA | | -- | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | - | - | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 3.7E-10 | -- | -- | NA | -- | - | -- | 2.6E-14 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 7.2E-12 | | -- | NA | - | | | 2.1E-15 | NA | | | NA | | | | NA |
| Beryllium | NA | -- | -- | 7.8E-10 | -- | | - | NA | NA | | | NA | | | | NA |
| Cadmium | NA | -- | -- | NA | -- | -- | -- | NA | NA | | | NA | | | | NA |
| Copper | 1.8E-08 | | -- | NA | -- | - | -- | 5.1E-15 | NA | | - | NA | | | | NA |
| Dibenzo(a,h)anthracene | 1.2E-11 | -- | - | NA | -- | - | | 3.5E-15 | NA | | - | NA | | | | NA |
| 1,1 Dichloroethene | NA | -- | - | NA | -- | | - | NA | NA | | | NA | | | | NA |
| 1,2 Dichloroethene | NA | | | NA | | | - | NA | NA | | | NA | | | | NA |
| Fluoranthene | 4.4E-11 | -- | - | NA | -- | - | -- | 2.5E-14 | NA | | -- | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.8E-11 | -- | -- | NA | - | -- | -- | 5.0E-15 | NA | | | NA | | | | NA |
| Lithium | NA | | | NA | - | -- | -- | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | - | - | | NA | NA | | - | NA | | | | NA |
| Mercury | 7.8E-11 | - | | NA | - | -- | - | 2.2E-19 | NA | | | NA | | | | NA |
| Molybdenum | NA | -- | | NA | | | -- | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Pyrene | 5.2E-11 | | | NA | | -- | - | 3.0E-14 | NA | | | NA | | | | NA |
| [illegible] | 1.5E-09 | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | - | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | - | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | 1.0E-06 | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | NA | | | - | 1.4E-05 | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | -- | | NA | -- | - | - | 4.7E-05 | NA | - | | NA | | | | NA |
| Radium 226 | NA | -- | - | NA | -- | | -- | NA | NA | - | -- | NA | | | | NA |
| Uranium 233/234 | 9.1E+00 | -- | -- | 3.5E+00 | - | -- | -- | 5.8E-03 | NA | -- | - | NA | | | | 3.7E-01 |
| Uranium 235 | 6.1E-01 | -- | - | 2.3E-01 | -- | - | -- | 7.9E-04 | NA | - | - | NA | - | | -- | 2.5E-02 |
| Uranium 238 | 2.4E+01 | -- | - | 6.5E+00 | | -- | -- | 3.4E-02 | NA | - | | NA | | | | 9.8E-01 |

Note: Radionuclide intakes are in units of pCi.
-- not an applicable pathway
NA not a COC for this medium or no toxicity factor available.

## Table 6-52
## Ecological Worker RME Carcinogenic Chemical Intakes for AOC3

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (mg/kg-day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Aluminum | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Antimony | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Aroclor-1254 | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Barium | — | — | NA | — | NA | 8.7E-08 | — | — | — | — | NA | — | NA | NA | — | — |
| Benzo(a)anthracene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Benzo(a)pyrene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Benzo(b)fluoranthene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Beryllium | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Cadmium | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Copper | — | — | NA | — | 2.1E-06 | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Dibenzo(a,h)anthracene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| 1,1-Dichloroethene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| 1,2-Dichloroethene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Fluoranthene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Indeno(1,2,3-cd)pyrene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Lithium | — | — | NA | — | NA | 1.9E-08 | — | — | — | — | NA | — | NA | NA | — | — |
| Manganese | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Mercury | — | — | 1.5E-08 | — | 2.1E-08 | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Molybdenum | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Nickel | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Pyrene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| [illegible] | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| [illegible] | — | — | NA | — | NA | 2.6E-07 | — | — | — | — | NA | — | NA | NA | — | — |
| Th[illegible] | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| [illegible] | — | — | N | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Vanadium | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Zinc | — | — | 2.3E-06 | — | 5.8E-06 | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Americium 241 | — | — | 7.8E+00 | — | 5.0E+00 | 1.2E-01 | — | — | — | — | NA | — | NA | NA | — | — |
| Plutonium 239/240 | — | — | 4.3E+01 | — | 2.8E+01 | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Radium 226 | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Uranium 233/234 | — | — | 5.6E+01 | — | NA | 2.8E+00 | — | — | — | — | NA | — | NA | NA | — | — |
| Uranium 235 | — | — | 3.6E+00 | — | NA | NA | — | — | — | — | NA | — | NA | NA | — | — |
| Uranium 238 | — | — | 5.0E+01 | — | NA | 3.2E+00 | — | — | — | — | NA | — | NA | NA | — | — |

Note: Radionuclide intakes are in units of pCi
— = not applicable pathway
NA = not COC for this medium or no toxicity factor available

## Table 6-53
## Open Space RME Carcinogenic Chemical Intakes for AOC3

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sed (mg/kg-day) | Dermal Absorption of Seep Sed (mg/kg-day) | Dermal Absorption of Stream Sed (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | -- | | NA | - | NA | NA | | | | | NA | | NA | NA | | |
| Aluminum | | -- | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Antimony | - | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Aroclor 1254 | | -- | NA | -- | NA | NA | | | | | NA | | NA | NA | | |
| Barium | | - | NA | -- | NA | 1.3E-06 | | | | | NA | | NA | NA | | |
| Benzo(a)anthracene | - | | NA | | NA | NA | - | - | | | NA | | NA | NA | | |
| Benzo(a)pyrene | -- | - | NA | -- | NA | NA | | -- | | | NA | | NA | NA | | |
| Benzo(b)fluoranthene | -- | - | NA | -- | NA | NA | | -- | | | NA | | NA | NA | | |
| Beryllium | -- | -- | NA | -- | NA | NA | -- | -- | | -- | NA | | NA | NA | - | |
| Cadmium | -- | - | NA | -- | NA | NA | | -- | - | | NA | | NA | NA | | |
| Copper | -- | - | NA | -- | 3.6E-06 | NA | -- | -- | -- | | NA | | NA | NA | | |
| Dibenzo(a,h)anthracene | -- | | NA | -- | NA | NA | -- | -- | | - | NA | | NA | NA | | |
| 1,1-Dichloroethene | -- | -- | NA | -- | NA | NA | -- | | | | NA | | NA | NA | | |
| 1,2-Dichloroethene | | -- | NA | - | NA | NA | | | | | NA | | NA | NA | | |
| Fluoranthene | | | NA | -- | NA | NA | | | - | | NA | | NA | NA | | |
| Indeno(1,2,3-cd)pyrene | -- | -- | NA | -- | NA | NA | -- | -- | - | | NA | | NA | NA | | |
| Lithium | | -- | NA | -- | NA | 2.8E-07 | | | -- | | NA | | NA | NA | | |
| Manganese | | | NA | -- | NA | NA | | | | | NA | | NA | NA | | |
| Mercury | | | 2.7E-08 | | 3.7E-08 | NA | | | | | NA | | NA | NA | | |
| Molybdenum | | | NA | | NA | NA | -- | | | - | NA | | NA | NA | | |
| Nickel | | | NA | | NA | NA | | | -- | | NA | - | NA | NA | | |
| Pyrene | | | NA | | NA | NA | | -- | | | NA | | NA | NA | | |
| | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| S[illegible] | | | NA | | NA | 3.9E-06 | | | | | NA | | NA | NA | | |
| T[illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| T[illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Vanadium | | | NA | | NA | NA | -- | | - | | NA | - | NA | NA | - | |
| Zinc | | | 4.0E-06 | | 1.0E-05 | NA | -- | | | | NA | | NA | NA | - | |
| Americium 241 | | -- | 1.4E+01 | -- | 8.7E+00 | 1.8E+00 | -- | | -- | - | NA | | NA | NA | | |
| Plutonium 239/240 | -- | -- | 7.4E+01 | -- | 4.8E+01 | NA | -- | | -- | | NA | | NA | NA | - | |
| Radium 226 | -- | - | NA | -- | NA | NA | -- | -- | -- | -- | NA | - | NA | NA | | |
| Uranium-233/234 | -- | -- | 9.8E+01 | -- | NA | 4.2E+01 | -- | -- | -- | | NA | -- | NA | NA | | |
| Uranium 235 | -- | -- | 6.3E+00 | -- | NA | NA | -- | -- | -- | - | NA | | NA | NA | | |
| Uranium 238 | -- | | 8.7E+01 | -- | NA | 4.7E+01 | -- | -- | -- | -- | NA | | NA | NA | -- | |

Note Radionuclide intakes are in units of pCi
-- not an applicable pathway
NA not COC for this medium or no toxicity factor is available.

## Table 6-54
## Ecological Worker CT Carcinogenic Chemical Intakes for AOC3

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | — | NA | — | NA | NA | | | - | - | NA | | NA | NA | | — |
| Aluminum | — | - | NA | | NA | NA | | | | | NA | | NA | NA | | — |
| Antimony | | | NA | | NA | NA | | | | | NA | | NA | NA | | — |
| Aroclor-1254 | — | | NA | — | NA | NA | | | | | NA | | NA | NA | - | — |
| Barium | — | | NA | — | NA | 5 1E-08 | | — | | | NA | | NA | NA | | — |
| Benzo(a)anthracen | — | | NA | - | NA | NA | — | | | | NA | | NA | NA | | — |
| Benzo(a)pyrene | — | | NA | - | NA | NA | | | | | NA | | NA | NA | | |
| Benzo(b)fluoranthene | | | NA | | NA | NA | | | | | NA | | NA | NA | — | |
| Beryllium | | | NA | — | NA | NA | - | | | | NA | - | NA | NA | | |
| Cadmium | | | NA | — | NA | NA | | — | — | | NA | | NA | NA | | — |
| Copper | — | | NA | — | 5.8E-07 | NA | | | | | NA | | NA | NA | | — |
| Dibenzo(,h)anthracene | — | - | NA | — | NA | NA | | | | | NA | | NA | NA | | — |
| 1 1 Dichloroethene | — | | NA | — | NA | NA | - | — | | | NA | | NA | NA | — | — |
| 1 2-Dichloroethene | | | NA | — | NA | NA | | | | | NA | | NA | NA | | |
| Fluoranthene | — | | NA | — | NA | NA | - | | | | NA | | NA | NA | | — |
| Indeno(1,2,3-cd)pyrene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | — |
| Lithium | | | NA | - | NA | 1 1E-08 | | - | | | NA | | NA | NA | | — |
| Manganese | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Mercury | | | 4 3E-09 | | 5 9E-10 | NA | | | | | NA | | NA | NA | | |
| Molybdenum | | | NA | | NA | NA | | | | | NA | | N | NA | | |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Pyrene | | | NA | | NA | NA | | | | | NA | | NA | NA | | — |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | — |
| [illegible] | | | NA | | NA | 1 5E-07 | | | | | NA | | NA | NA | | — |
| T[illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| T[illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | — |
| Vanadium | | | NA | | NA | NA | | | | | NA | | NA | NA | | — |
| Z[illegible] | | | 4E-07 | — | 1 6E-06 | NA | | | | | NA | | NA | NA | | — |
| Americium 241 | | | 2 2E+00 | - | 1 4E+00 | 7 0E-02 | | | | | NA | | NA | NA | | — |
| Plutonium 239/240 | - | — | 1 2E+01 | - | 7 7E+00 | NA | | — | | | NA | | NA | NA | | — |
| Radium 226 | — | | NA | | NA | NA | - | | - | | NA | | NA | NA | | - |
| Uranium 233/234 | | — | 1 6E+01 | - | NA | 1 6E+00 | — | — | — | | NA | | NA | NA | | — |
| Uranium 235 | | — | 1 0E+00 | - | NA | NA | | | | | NA | | NA | NA | | |
| Uranium 238 | | | 1 4E+01 | | NA | 1 8E+00 | - | | | | NA | | NA | NA | | |

Note Radionuclide intakes are in units of pCi
— not an applicable pathway
NA not a COC for this medium or no toxicity factor available

## Table 6-55
## Open Space User CT Carcinogenic Chemical Intakes for AOC3

| Chemical | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | — | — | NA | — | NA | NA | | — | — | | NA | | NA | NA | | |
| Aluminum | | — | NA | — | NA | NA | | | | | NA | | NA | NA | | |
| Antimony | | — | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Aroclor 1254 | | — | NA | — | NA | NA | — | | | | NA | | NA | NA | | |
| Barium | | — | NA | | NA | 6.5E-08 | | | | | NA | | NA | NA | | |
| Benzo(a)anthracene | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Benzo(a)pyrene | — | | NA | — | NA | NA | | | | | NA | | NA | NA | | |
| Benzo(b)fluoranthene | | — | NA | — | NA | NA | | | | | NA | | NA | NA | | |
| Beryllium | | — | NA | — | NA | NA | | — | | | NA | | NA | NA | | |
| Cadmium | — | | NA | — | NA | NA | — | | | — | NA | | NA | NA | | |
| Copper | | — | NA | — | 2.1E-07 | NA | — | — | | | NA | | NA | NA | | |
| Dibenzo(a,h)anthracene | — | | NA | — | NA | NA | — | — | | | NA | | NA | NA | | |
| 1,1-Dichloroethene | | | NA | — | NA | NA | | | | | NA | | NA | NA | | |
| 1,2-Dichloroethene | — | | NA | | NA | NA | | — | | | NA | | NA | NA | | |
| Fluoranthene | | — | NA | — | NA | NA | | | | | NA | | NA | NA | | |
| Indeno(1,2,3-cd)pyrene | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Lithium | | | NA | | NA | 1.4E-08 | — | | — | | NA | | NA | NA | | |
| Manganese | | | NA | — | NA | NA | — | | | | NA | | NA | NA | | |
| Mercury | | | 1.6E-09 | — | 2.2E-09 | NA | | | | | NA | | NA | NA | | |
| Molybdenum | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Pyrene | | | NA | | NA | NA | | | | | NA | — | NA | NA | | |
| S[illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| S[illegible] | | | NA | | NA | 1.9E-07 | | | | | NA | | NA | NA | | |
| T[illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| T[illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Vanadium | | | NA | | NA | NA | | | | | NA | | NA | NA | | |
| Z[illegible] | | | 2.3E-07 | | 5.9E-07 | NA | — | | | | NA | — | NA | NA | | |
| Americium 241 | | | 7.9E-01 | — | 5.1E-01 | 9.0E-02 | | | | — | NA | | NA | NA | | |
| Plutonium 239/240 | | — | 4.3E+00 | — | 2.8E+00 | NA | — | — | — | | NA | | NA | NA | | |
| Radium 226 | | — | NA | — | NA | NA | | — | | | NA | — | NA | NA | | |
| Uranium 233/234 | — | | 5.7E+00 | — | NA | 2.1E+00 | — | — | — | — | NA | — | NA | NA | | |
| Uranium 235 | — | — | 3.7E-01 | — | NA | NA | — | — | — | — | NA | — | NA | NA | | |
| Uranium 238 | — | — | 5.1E+00 | — | NA | 2.4E+00 | — | — | | — | NA | — | NA | NA | — | |

Note Radionuclide intakes are in units of pCi
— not an applicable pathway
NA not COC for this medium or no toxicity factor is available.

## Table 6-56
## Construction Worker RME Noncarcinogenic Chemical Intakes for AOC1

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Aluminum | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Antimony | NA | 2.0E-06 | | | | | | NA | NA | NA | | NA | | | | NA |
| Aroclor 1254 | 1.7E-07 | 5.9E-08 | | | | | | 4.2E-11 | 2.0E-07 | 7.0E-08 | | NA | | | | NA |
| Barium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Benzo(a)anthracene | 6.1E-07 | 6.5E-07 | | | | | | 1.9E-10 | NA | NA | | NA | | | | NA |
| Benzo(a)pyrene | 4.6E-07 | 6.1E-07 | | | | | | 1.8E-10 | NA | NA | | NA | | | | NA |
| Benzo(b)fluoranthene | 6.2E-07 | 6.8E-07 | | | | | | 2.1E-10 | NA | NA | | NA | | | | NA |
| Beryllium | NA | 2.2E-07 | | | | | | NA | NA | NA | | NA | | | | NA |
| Cadmium | NA | 3.3E-07 | | | | | | NA | NA | 3.3E-08 | | NA | | | | NA |
| Copper | 1.5E-05 | 2.5E-06 | | | | | | 1.9E-12 | NA | NA | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 2.8E-07 | NA | | | | | | 3.9E-11 | NA | NA | | NA | | | | NA |
| 1,1-Dichloroethene | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| 1,2-Dichloroethene | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Fluoranthene | 5.3E-07 | NA | | | | | | 5.4E-10 | NA | NA | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 7.7E-07 | NA | | | | | | 1.3E-10 | NA | NA | | NA | | | | NA |
| Lithium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Manganese | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Mercury | 6.8E-08 | NA | | | | | | 8.0E-14 | NA | NA | | NA | | | | NA |
| Molybdenum | NA | 1.4E-05 | | | | | | NA | NA | NA | | NA | | | | NA |
| Nickel | NA | 1.2E-05 | | | | | | NA | NA | NA | | NA | | | | NA |
| Pyrene | [illegible] | NA | | | | | | 4.8E-10 | NA | NA | | NA | | | | NA |
| [illegible] | 9 [illegible] 07 | 1.3E-06 | | | | | | 6.4E-16 | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Americium-241 | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Plutonium-239/240 | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Radium-226 | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Uranium-233/234 | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Uranium-235 | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Uranium-238 | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi
— not an applicable pathway
NA – not a COC for this medium or toxicity factor not available

## Table 6-57
## Current Worker RME Noncarcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sed (mg/kg-day) | Dermal Absorption of Seep Sed (mg/kg-day) | Dermal Absorption of Stream Sed (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | — | — | | — | NA | NA | | | | | | | NA |
| Aluminum | NA | | — | — | | | | NA | NA | — | | | | | | NA |
| Antimony | NA | | — | — | | | | NA | NA | | | | | | | NA |
| Aroclor 1254 | 1.50E-07 | — | | — | | | | 2.09E-10 | 1.22E-06 | | | | | | | NA |
| Barium | NA | — | — | — | | | | NA | NA | | | | | | | NA |
| Benzo(a)anthracene | 5.27E-07 | — | — | | — | | — | 9.61E-10 | NA | | | | | | | NA |
| Benzo(a)pyrene | 4.00E-07 | — | — | — | — | | | 8.84E-10 | NA | | | | | | | NA |
| Benzo(b)fluoranthene | 5.35E-07 | — | — | — | | | | 1.04E-09 | NA | | | | | | | NA |
| Beryllium | NA | — | — | — | — | — | — | NA | NA | | | | | | | NA |
| Cadmium | NA | — | — | — | — | — | — | NA | NA | | | | | | | NA |
| Copper | 1.34E-05 | — | — | — | — | — | — | 9.39E-12 | NA | | | | | | | NA |
| Dibenzo(a,h)anthracene | 2.45E-07 | — | — | — | — | — | — | 1.94E-10 | NA | | | | | | | NA |
| 1,1-Dichloroethene | NA | | — | — | — | | | NA | NA | | | | | | | NA |
| 1,2-Dichloroethene | NA | — | | | | — | | NA | NA | | | | | | | NA |
| Fluoranthene | 4.64E-07 | — | | — | | — | | 2.66E-09 | NA | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 6.68E-07 | — | — | — | — | — | — | 6.35E-10 | NA | | | | | | | NA |
| Lithium | NA | — | | — | — | — | — | NA | NA | | | | | | | NA |
| Manganese | NA | | | | | | | NA | NA | | | | | | | NA |
| Mercury | 5.87E-08 | | | | | | | 3.96E-13 | NA | | | | | | | NA |
| Molybdenum | NA | | — | | | | | NA | NA | | | | | | | NA |
| Nickel | NA | | | | | — | | NA | NA | | | | | | | NA |
| Pyrene | 4.13E-07 | | | | | | | 2.36E-09 | NA | | | | | | | NA |
| Silver | 7.78E-07 | | | | | | | 3.18E-15 | NA | | | | | | | NA |
| [illegible]m | NA | | | | | | | NA | NA | | | | | | | NA |
| Thallium | NA | | | | | | | NA | NA | | | | | | | NA |
| Trichloroethene | NA | | | | | | | NA | NA | | | | | | | NA |
| Vanadium | NA | | | | | | | NA | NA | | | | | | | NA |
| Zinc | NA | — | — | | — | — | — | NA | NA | — | | | | | | NA |
| Americium-241 | NA | | — | — | — | — | | NA | NA | | | | | | — | NA |
| Plutonium-239/240 | NA | — | — | | — | — | — | NA | NA | — | — | — | | | | NA |
| Radium-226 | NA | — | — | — | — | — | — | NA | NA | — | — | — | | | | NA |
| Uranium-233/234 | NA | — | — | — | — | — | — | NA | NA | — | | — | — | — | — | NA |
| Uranium-235 | NA | — | — | — | — | — | — | NA | NA | — | — | | | | | NA |
| Uranium-238 | NA | — | — | | — | — | — | NA | NA | — | | — | — | | | NA |

Note: Radionuclide intakes are in units of pCi
— = not an applicable pathway
NA = not a COC for this medium or no toxicity factor is available

Table 6-58
Ecological Worker RME Noncarcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 8.3E-08 | | | 6.9E-06 | | | | NA | NA | | | NA | | | | NA |
| Barium | NA | | | NA | | | | 9.1E-11 | 4.4E-07 | | | NA | | | | NA |
| Benzo(a)anthracene | 2.9E-07 | | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 2.2E-07 | | | NA | | | | 4.2E-10 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 2.9E-07 | | | NA | | | | 3.9E-10 | NA | | | NA | | | | NA |
| Beryllium | NA | | | NA | | | | 4.6E-10 | NA | | | NA | | | | NA |
| Cadmium | NA | | | 2.3E-07 | | | | NA | NA | | | NA | | | | NA |
| Copper | 7.4E-06 | | | NA | | | | NA | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 1.3E-07 | | | NA | | | | 4.1E-12 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | | | NA | | | | 8.5E-11 | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Fluoranthene | 2.5E-07 | | | NA | | | | NA | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 3.7E-07 | | | NA | | | | 1.2E-09 | NA | | | NA | | | | NA |
| Lithium | NA | | | NA | | | | 2.8E-10 | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Mercury | 3.2E-08 | | | NA | | | | NA | NA | | | NA | | | | NA |
| Molybdenum | NA | | | NA | | | | 1.7E-13 | NA | | | NA | | | | NA |
| N[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Py[illegible] | [illegible] | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | 4.3E-07 | | | NA | | | | 1.0E-09 | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | 1.4E-15 | NA | | | NA | | | | NA |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Z[illegible] | NA | | | 1.9E-05 | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Radium 226 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium 233/234 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium 235 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium 238 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi
— not an applicable pathway
NA = not a COC for this medium or no toxicity factor available

# Table 6-59
## Office Worker RME Noncarcinogenic Chemical Intakes for AOC1

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg day) | Ingestion of Subsurface Soil (mg/kg day) | Ingestion of Pond Sediments (mg/kg day) | Ingestion of Seep Sediment (mg/kg day) | Ingestion of Stream Sediment (mg/kg day) | Ingestion of Surface Water (mg/kg day) | Ingestion of Seep Water (mg/kg day) | Inhalation of Airborne Particulate (mg/kg day) |
|---|---|---|---|---|---|---|---|---|
| Acetone | NA | -- | -- | -- | | - | - | NA |
| Aluminum | NA | | | - | | | | NA |
| Antimony | NA | -- | | | | | | NA |
| Aroclor 1254 | 1 5E 07 | | | - | | - | - | 2 1E 10 |
| Barium | NA | - | - | - | | | | NA |
| Benzo(a)anthracene | 5 3E-07 | - | - | | | | | 9 6E 10 |
| Benzo(a)pyrene | 4 0E-07 | | | - | | | | 8 8E 10 |
| Benzo(b)fluoranthene | 5 4E-07 | - | | | | | | 1 0E 09 |
| Beryllium | NA | -- | - | -- | | | | NA |
| Cadmium | NA | | | | | | | NA |
| Copper | 1 3E-05 | - | | -- | | | | 9 4E 12 |
| Dibenzo(a,h)anthracene | 2 4E-07 | | | | | | | 1 9E 10 |
| 1 1 Dichloroethane | NA | | | | | | | NA |
| 1 2 Dichloroethene | NA | | | | | | | NA |
| Fluoranthene | 4 6E-07 | | | | | | - | 2 7E 09 |
| Indeno(1 2 3 cd)pyrene | 6 7E 07 | | | - | | | | 6 4E 10 |
| Lithium | NA | | | | | | - | NA |
| Manganese | NA | | | | | | | NA |
| Mercury | 5 9E-08 | | - | | | - | - | 4 0E 13 |
| Molybdenum | NA | - | -- | - | -- | | -- | NA |
| Nickel | NA | -- | -- | -- | | | -- | NA |
| Pyrene | 4 1E-07 | -- | - | -- | - | -- | -- | 2 4E 09 |
| Silver | 7.8E-07 | -- | - | -- | | -- | -- | 3 2E 15 |
| Strontium | NA | -- | - | -- | -- | - | -- | NA |
| Tetrachloroethene | NA | -- | -- | -- | - | -- | -- | NA |
| Trichloroethene | NA | -- | -- | -- | -- | -- | -- | NA |
| Vanadium | NA | -- | | -- | -- | -- | - | NA |
| Zinc | NA | - | -- | -- | -- | | -- | NA |
| Americium 241 | NA | - | -- | | - | | - | NA |
| Plutonium-239/240 | NA | -- | - | -- | | | - | NA |
| Radium-226 | NA | -- | -- | -- | -- | -- | - | NA |
| Uranium-233/234 | NA | | | -- | -- | - | -- | NA |
| Uranium-235 | NA | | | -- | | | | NA |
| Uranium-238 | NA | | | -- | | | | NA |

Note Reported intake in units of mg/kg-day
-- not applicable to pathway
NA not a COC for this medium or no toxicity factor is available

## Table 6-60
## Adult Open Space User RME Carcinogenic Chemical Intakes for AOC1

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (yr per pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | — | | NA | NA | — | — | NA | | | | NA |
| Aluminum | NA | — | — | NA | | | — | NA | NA | | | NA | | | | NA |
| Antimony | NA | | — | 1.3E-06 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 1.5E-08 | | — | NA | — | — | | 2.2E-11 | 1.9E-07 | | | NA | | | | NA |
| Barium | NA | — | — | NA | — | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 5.3E-08 | — | — | NA | — | | | 1.0E-10 | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 4.0E-08 | — | — | NA | — | | | 9.3E-11 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 5.4E-08 | — | | NA | — | | | 1.1E-10 | NA | | | NA | | | | NA |
| Beryllium | NA | — | — | 4.2E-08 | — | — | — | NA | NA | | | NA | | | | NA |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Copper | 1.3E-06 | | — | NA | | | | 9.9E-13 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 2.4E-08 | — | — | NA | — | | | 2.0E-11 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | — | — | NA | | | | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Fluoranthene | 4.6E-08 | | | NA | | | | 2.8E-10 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 6.7E-08 | — | | NA | | | | 6.7E-11 | NA | | | NA | | | | NA |
| Lithium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Mercury | 5.[illegible]E-09 | | | NA | | | | 4.2E-14 | NA | | | NA | | | | N |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Pyrene | 1[illegible]E-08 | | | NA | | | | 2.5E-10 | NA | | | NA | | | | NA |
| [illegible] | 7.[illegible]E-08 | | | NA | | | | 3.3E-16 | NA | | | NA | | | | NA |
| S[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Trichloroethene | NA | | | NA | | — | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | — | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | 3.4E-06 | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | — | | NA | — | — | | NA | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Radium 226 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium 233/234 | NA | — | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium 235 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium 238 | NA | — | — | NA | | | | NA | NA | | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi
— not applicable pathway
NA not a COC for this medium or toxicity factor is not available

Table 6-61

Child Open Space User RME Noncarcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Absorption of Subsurface Soil (mg/kg-day) | Absorption of Pond Sediment (mg/kg-day) | Absorption of Seep Sediment (mg/kg-day) | Absorption of Stream Sediment (mg/kg-day) | Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | Rad Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | - | NA | | | | | | | | | | | | NA |
| Aluminum | NA | | — | NA | - | | | | | | | | | | | NA |
| Antimony | NA | - | - | 1.2E-05 | | | | | | | | | | | | NA |
| Aroclor 1254 | 1.4E-07 | - | | NA | | | — | | | | | | | | | NA |
| Barium | NA | | - | NA | | | - | | | | | | | | | NA |
| Benzo(a)anthracene | 4.9E-07 | | — | NA | | | | | | | | | | | | NA |
| Benzo(a)pyrene | 3.7E-07 | | — | NA | | | | | | | | | | | | NA |
| Benzo(b)fluoranthene | 5.0E-07 | — | — | NA | | — | | - | | | | | | | | NA |
| Beryllium | NA | — | | 3.9E-07 | | | | | | | | | | | | NA |
| Cadmium | NA | — | — | NA | - | | | | | | | | | | | NA |
| Copper | 1.3E-05 | | | NA | | | | | | | | | | | | NA |
| Dibenzo(a,h)anthracene | 2.3E-07 | | | NA | | | | | | | | | | | | NA |
| 1,1-Dichloroethene | NA | - | - | NA | — | - | | - | | | | | | | | NA |
| 1,2-Dichloroethene | NA | — | — | NA | — | — | — | — | — | | | | | | | NA |
| Fluoranthene | 4.3E-07 | | — | NA | — | — | | — | | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 6.2E-07 | — | — | NA | — | — | | | | | | | | | | NA |
| Lithium | NA | — | — | NA | | | | - | | | | | | | | NA |
| Manganese | NA | | | NA | | | | | | | | | | | | NA |
| Mercury | 5.5E-08 | | | NA | | | | | | | | | | | | NA |
| Molybdenum | NA | | | NA | | | | — | | | | | | | | NA |
| Nickel | NA | | | NA | | | | | | | | | | | | NA |
| Pyrene | 3.9E-07 | | | NA | | | | | | | | - | | | | NA |
| [illegible] | 7.3E-07 | | | NA | | | | | | | - | | | | | NA |
| [illegible] | NA | | | NA | | | | | | | | | | | | NA |
| Tetrachloroethene | NA | | | NA | - | | | - | - | | | | | | | NA |
| Trichloroethene | NA | — | | NA | — | | | — | — | | | | | | | NA |
| Vanadium | NA | — | — | NA | — | — | | — | — | | | | | | | NA |
| Zinc | NA | — | - | 3.2E-05 | — | — | — | — | - | - | | | | | | NA |
| Americium 241 | NA | — | - | NA | — | — | — | - | — | - | — | | | | | NA |
| Plutonium 239/240 | NA | — | — | NA | — | — | — | — | — | - | — | - | | | | NA |
| Radium-226 | NA | — | - | NA | — | - | - | — | — | — | - | | | | | NA |
| Uranium 233/234 | NA | — | — | NA | — | — | — | — | — | — | — | — | | | | NA |
| Uranium 235 | NA | — | — | NA | — | | | — | - | | | | | | | NA |
| Uranium 238 | NA | — | - | NA | | | | — | - | | | | | | | NA |

Note: Radionuclide intakes are in units of pCi

— = not an applicable pathway

NA = not a COC for this medium or no toxicity factor is available

## Table 6-62
## Construction Worker CT Noncarcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | — | — | | — | NA | NA | NA | | NA | | | | NA |
| Aluminum | NA | NA | — | — | | — | — | NA | NA | NA | | NA | | | | NA |
| Antimony | NA | 3 6E-07 | — | — | | | | NA | NA | NA | | NA | | | | NA |
| Aroclor 1254 | 3 1E-08 | 1 1E-08 | — | — | | | | 3 4E-11 | 3 7E-08 | 1.3E-08 | | NA | | | | NA |
| Barium | NA | NA | — | — | | | | NA | NA | NA | | NA | | | | NA |
| Benzo(a)anthracene | 1 1E-07 | 1 2E-07 | — | | — | | | 1 6E-10 | NA | NA | | NA | | | | NA |
| Benzo(a)pyrene | 8 2E-08 | 1 1E-07 | | — | — | | | 1 4E-10 | NA | NA | | NA | | | | NA |
| Benzo(b)fluoranthene | 1 1E-07 | 1 2E-07 | — | — | — | | — | 1 7E 10 | NA | NA | | NA | | | | NA |
| Beryllium | NA | 3 9E-08 | — | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| Cadmium | NA | 5 9E-08 | — | — | — | | — | NA | NA | NA | | NA | | | | NA |
| Copper | 2 8E-06 | 4 4E-06 | — | — | — | | — | 1 5E-12 | NA | 5 9E-09 | | NA | | | | NA |
| Dibenzo(a,h)anthracen | 5 0E-08 | NA | — | — | — | — | — | 3 2E-11 | NA | NA | | NA | | | | NA |
| 1 1 Dichloroethene | NA | NA | — | — | — | — | | NA | NA | NA | | NA | | | | NA |
| 1 2 Dichloroethene | NA | NA | — | | | — | — | NA | NA | NA | | NA | | | | NA |
| Fluoranthene | 9 5E-08 | NA | | | | — | | 4 3E-10 | NA | NA | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1 4E-07 | NA | | — | — | — | — | 1 0E-10 | NA | NA | | NA | | | | NA |
| Lithium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Manganese | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Mercury | 1 2E 08 | NA | | — | | — | | 6 4E-14 | NA | NA | | NA | | | | NA |
| Molybdenum | NA | 2 5E-06 | | | | — | | NA | NA | NA | | NA | | | | NA |
| Nickel | NA | 2 1E-06 | | | | | | NA | NA | NA | | NA | | | | NA |
| l y | 5E 08 | NA | | | | | | 3 8E-10 | NA | NA | | NA | | | | NA |
| i | 1 E 07 | 2 2E-07 | | | | | | 5 2E-16 | NA | NA | | NA | | | | NA |
| | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| r | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| T hl rue h | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Vanadium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Z | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Americium 241 | NA | NA | | — | — | | — | NA | NA | NA | | NA | | | | NA |
| Plutonium 239/240 | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| Radium 226 | NA | NA | — | — | — | — | | NA | NA | NA | | NA | | | | NA |
| Uranium 233/234 | NA | NA | — | | | — | | NA | NA | NA | | NA | | | | NA |
| Uranium 235 | NA | NA | — | | | — | | NA | NA | NA | | NA | | | | NA |
| Uranium 238 | NA | NA | — | — | | | — | NA | NA | NA | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi

--- not an applicable pathway

NA = not a COC for this medium or no toxicity factor is available

**Table 6-63**
**Current Work CT Noncarcinogenic Chemical Intake for AOC1**

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | - | — | | — | — | NA | NA | | | | | | | NA |
| Aluminum | NA | — | — | - | | | — | NA | NA | | | | | | | NA |
| Antimony | NA | | — | — | | | | NA | NA | | | | | | | NA |
| Aroclor 1254 | 2 37E-08 | | — | - | | — | — | 1 65E-10 | 1 93E-07 | | | | | | | NA |
| Barium | NA | | | — | - | | — | NA | NA | - | | | | | | NA |
| Benzo(a)anthracene | 8 32E-08 | — | — | - | - | | — | 7 58E-10 | NA | | | | | | | NA |
| Benzo(a)pyrene | 6 31E-08 | | — | — | | | - | 6 97E-10 | NA | | | | | | | NA |
| Benzo(b)fluoranthene | 8 44E-08 | | — | — | — | | — | 8 23E-10 | NA | | | | | | | NA |
| Beryllium | NA | | | — | - | — | | NA | NA | | | | | | | NA |
| Cadmium | NA | — | - | — | — | — | | NA | NA | | | | | | | NA |
| Copper | 2.12E-06 | — | — | — | — | | — | 7 40E-12 | NA | | — | — | | | | NA |
| Dibenzo(a,h)anthracene | 3 86E-08 | — | — | — | — | — | — | 1 53E-10 | NA | | — | | | | | NA |
| 1,1 Dichloroethene | NA | — | — | — | | — | — | NA | NA | | | | | | | NA |
| 1,2-Dichloroethane | NA | — | - | — | - | — | — | NA | NA | | | | | | | NA |
| Fluoranthene | 7 31E-08 | — | — | — | — | — | — | 2.10E-09 | NA | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1 05E-07 | — | — | — | — | - | — | 5 01E-10 | NA | | | | | | | NA |
| Lithium | NA | — | — | — | — | — | — | NA | NA | — | | | | | | NA |
| Manganese | NA | - | — | — | — | — | — | NA | NA | | - | | | | | NA |
| Mercury | 9 26E-09 | - | — | — | | | — | 3 12E-13 | NA | | | | | | | NA |
| Molybdenum | NA | | | - | | | | NA | NA | | | | | | | NA |
| N[illegible] | NA | | | — | | — | — | NA | NA | - | — | — | | | | NA |
| [illegible] | [illegible] | | | | | | | 1 86E 09 | NA | | | | | | | NA |
| [illegible] | 1 2[illegible] 07 | | | | | | | 2.50E-15 | NA | | | | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| [illegible] | NA | | | | | | — | NA | NA | | | | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| V[illegible] | NA | | | | | | | NA | NA | | | - | | | | NA |
| Z[illegible] | NA | | | | | | — | NA | NA | - | | | | | | NA |
| Americ[illegible] 241 | NA | | | | — | | | NA | NA | | | | | | | NA |
| Plutonium 239/240 | NA | - | | — | | — | — | NA | NA | - | | | | | | NA |
| Radium 226 | NA | — | — | — | — | — | — | NA | NA | | | | | | | NA |
| Uranium 233/234 | NA | — | - | — | - | - | — | NA | NA | — | | | - | | | NA |
| Uranium 235 | NA | — | — | — | - | — | — | NA | NA | — | - | | | | | NA |
| Uranium 238 | NA | — | — | — | | — | — | NA | NA | - | | | | | | NA |

Note Radionuclide intakes are in units of pCi
— not an applicable pathway
NA not a COC for this medium or no toxicity factor is available

## Table 6-64
## Ecological Worker CT Noncarcinogenic Chemical Intakes for AOC1

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | [illegible] Exposure [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | --- | --- | NA | - | | --- | NA | NA | | | NA | | | | NA |
| Al m num | NA | | --- | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | - | --- | 1 9E-06 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 2 3E-08 | -- | -- | NA | --- | -- | - | 4 9E-11 | 7 9E-08 | | | NA | | | | NA |
| Barium | NA | --- | --- | NA | -- | | - | NA | NA | | - | NA | | | | NA |
| Benzo(a)anthracene | 8 1E-08 | --- | --- | NA | --- | | | 2 2E-10 | NA | | -- | NA | | | | NA |
| Benzo(a)pyrene | 6 2E-08 | | --- | NA | --- | --- | - | 2 1E-10 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 8 2E-08 | --- | --- | NA | -- | --- | | 2 4E-10 | NA | | | NA | | | | NA |
| Beryllium | NA | | | 6.4E-08 | --- | | --- | NA | NA | | | NA | | | | NA |
| Cadmi m | NA | -- | | NA | --- | --- | | NA | NA | | | NA | | | | NA |
| C pper | 2 1E-06 | -- | --- | NA | --- | -- | -- | 2 2E-12 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracen | 3 8E-08 | --- | --- | NA | --- | - | --- | 4 5E-11 | NA | | | NA | | | | NA |
| 1,1 Dichloroethene | NA | | | NA | --- | | | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | | --- | NA | --- | --- | --- | NA | NA | | | NA | | | | NA |
| Fluoranthene | 7 1E-08 | --- | -- | NA | | -- | | 6 2E-10 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1 0E-07 | | | NA | --- | -- | --- | 1 5E-10 | NA | | | NA | | | | NA |
| Lithi m | NA | | | NA | | --- | | NA | NA | | | NA | | | | NA |
| M nganese | NA | | | NA | -- | - | --- | NA | NA | | - | NA | | | | NA |
| Merc ry | 9 0E-09 | --- | | NA | --- | | --- | 9 2E-14 | NA | | | NA | | | | NA |
| Molybde m | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| N k l | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Py | 4E 08 | | | NA | | | | 5 5E-10 | NA | | | NA | - | | | NA |
| | 1 2E 07 | | | NA | | | | 7 4E 16 | NA | | | NA | | | | NA |
| S | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T h | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| adi m | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Z | NA | - | | 5 3E-06 | | | | NA | NA | | | NA | | | | NA |
| Am ric m 241 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Pl ton um 239/240 | NA | | | NA | - | | --- | NA | NA | | | NA | | | | NA |
| Rad m 226 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uran m 233/234 | NA | --- | | NA | | - | --- | NA | NA | | | NA | | | | NA |
| Uranium 235 | NA | - | | NA | | | | NA | NA | | | NA | | | | NA |
| Urani m 238 | NA | - | | NA | | | --- | NA | NA | | --- | NA | | | | NA |

Not Radi uclide ntake re in units f pCi
--- not n pplicabl p thw y
NA - n t COC f thi medium r n toxicity facto ail bl

## Table 6-65
## Office Worker CT Noncarcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | [illegible] (y[illegible]/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | -- | -- | -- | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | -- | | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | -- | -- | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 1.2E-08 | | | -- | | | | 1.2E-10 | 1.2E-07 | | | NA | | | | NA |
| Barium | NA | -- | -- | -- | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 4.2E-08 | | | -- | -- | | -- | 5.8E-10 | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 3.2E-08 | -- | -- | -- | -- | | -- | 5.3E-10 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 4.2E-08 | -- | -- | -- | | | | 6.2E-10 | NA | | | NA | | | | NA |
| Beryllium | NA | -- | -- | -- | | | -- | NA | NA | | | NA | | | | NA |
| Cadmium | NA | | -- | -- | -- | | -- | NA | NA | | -- | NA | | | | NA |
| Copper | 1.1E-06 | -- | -- | -- | -- | -- | -- | 5.6E-12 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 1.9E-08 | -- | -- | -- | -- | -- | -- | 1.2E-10 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | -- | | -- | | | -- | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | -- | -- | -- | -- | | -- | NA | NA | | -- | NA | | | | NA |
| Fluoranthene | 3.7E-08 | -- | | -- | -- | -- | -- | 1.6E-09 | NA | | -- | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 5.3E-08 | -- | | -- | -- | | | 3.8E-10 | NA | | -- | NA | | | | NA |
| Lithium | NA | | -- | -- | -- | | -- | NA | NA | | -- | NA | | | | NA |
| Manganese | NA | | -- | | | -- | -- | NA | NA | | | NA | | | | NA |
| Mercury | 6E-09 | | | -- | -- | -- | -- | 2.4E-13 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Py[illegible] | [illegible] | | | | | | | 1.4E-09 | NA | | -- | NA | | | | NA |
| [illegible] | [illegible] | | | | | | | 1.9E-15 | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| V[illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Z[illegible] | NA | | | | | | | NA | NA | | -- | NA | | | | NA |
| Americium 241 | NA | | | -- | | -- | | NA | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | -- | -- | -- | -- | NA | NA | | | NA | | | | NA |
| Radium 226 | NA | -- | -- | -- | | -- | -- | NA | NA | | -- | NA | | | | NA |
| Uranium 233/234 | NA | | -- | -- | | | -- | NA | NA | -- | -- | NA | | | | NA |
| Uranium 235 | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | NA | | | | NA |
| Uranium 238 | NA | -- | -- | -- | -- | | | NA | NA | | -- | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi
-- not an applicable pathway
NA not a COC for this medium or no toxicity factor is available

**Table 6-66**
**Adult Open Space User CT Noncarcinogenic Chemical Intakes for AOC1**

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sed (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Rad Exposure [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | — | | NA |
| Aluminum | NA | — | | NA | — | | — | NA | NA | | | NA | | | | NA |
| Antimony | NA | — | — | 2.5E-07 | | | — | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 3.0E-09 | — | — | NA | — | | | 1.6E-12 | 2.9E-09 | | | NA | | | | NA |
| Barium | NA | — | — | NA | — | — | | NA | NA | | — | NA | | | | NA |
| Benzo(a)anthracene | 1.1E-08 | — | — | NA | — | | — | 7.2E-12 | NA | | — | NA | | | | NA |
| Benzo(a)pyrene | 8.0E-09 | — | — | NA | | — | — | 6.6E-12 | NA | | — | NA | | | | NA |
| Benzo(b)fluoranthene | 1.1E-08 | — | — | NA | — | | — | 7.8E-12 | NA | | | NA | | | | NA |
| Beryllium | NA | — | — | 8.3E-09 | — | | — | NA | NA | | | NA | | | | NA |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | | | NA |
| Copper | 2.7E-07 | — | — | NA | — | | — | 7.0E-14 | NA | | — | NA | | | | NA |
| Dibenz(a,h)anthracene | 4.9E-09 | — | | NA | — | — | | 1.5E-12 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | — | | NA | | — | | NA | NA | | | NA | | | — | NA |
| 1,2-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | | — | NA | | | | NA |
| Fluoranthene | 9.3E-09 | — | — | NA | — | — | — | 2.0E-11 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.3E-08 | | — | NA | — | — | — | 4.8E-12 | NA | | | NA | | | | NA |
| Lithium | NA | | | NA | — | — | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | | | — | NA | NA | | | NA | | | | NA |
| Mercury | 1.2E-09 | | | NA | | | | 3.0E-15 | NA | | | NA | | | | NA |
| Methylene [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | — | | NA | NA | | | NA | | | | N |
| Py[illegible] | 8.3E-09 | | | NA | | | | 1.8E-11 | NA | | — | NA | | | | NA |
| [illegible] | 1.6E-08 | | | NA | | | | 2.4E-17 | NA | | | NA | | | | NA |
| S[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T[illegible] | N | | | NA | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Z[illegible] | NA | | | 6.8E-07 | | — | | NA | NA | | | NA | — | | | NA |
| Americium 241 | NA | | — | NA | — | | | NA | NA | | | NA | — | — | | NA |
| Plutonium 239/240 | NA | | — | NA | — | — | — | NA | NA | — | | NA | | | | NA |
| Radium 226 | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | | | NA |
| Uranium 233/234 | NA | — | — | NA | | | — | NA | NA | — | | NA | | | | NA |
| Uranium 235 | NA | — | — | NA | | — | — | NA | NA | — | | NA | | | | NA |
| Uranium 238 | NA | — | | NA | — | | — | NA | NA | | — | NA | | | | NA |

Not[illegible] Radi[illegible] ucl[illegible] de intak[illegible] re[illegible] unit [illegible] f pCi
— not [illegible] n [illegible] pplicabl[illegible] pathw[illegible] y
NA – n[illegible] t COC f[illegible] r thi[illegible] medium [illegible] r n[illegible] toxicity factor [illegible] a[illegible] ailabl[illegible]

Table 6-67
Child Open Space User CT Noncarcinogenic Chemical Intakes for AOC1

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | - | | — | - | | - | | | | | | NA |
| Aluminum | NA | | — | NA | - | | | | | | | | | | | NA |
| Antimony | NA | | — | 2.3E-06 | | | | | | | | | | | | NA |
| Aroclor 1254 | 2.8E-08 | | | NA | | | | | | | | | | | | NA |
| Barium | NA | | | NA | | — | | | | | | | | | | NA |
| Benzo(a)anthracene | 9.8E-08 | - | | NA | | | | | | | | | | | | NA |
| Benzo(a)pyrene | 7.5E-08 | — | — | NA | | — | | - | | - | | | | | | NA |
| Benzo(b)fluoranthene | 1.0E-07 | - | — | NA | — | - | — | | | | | | | | | NA |
| Beryllium | NA | - | — | 7.8E-08 | — | — | — | — | — | | | | - | | - | NA |
| Cadmium | NA | — | — | NA | — | — | — | - | | | | | | | - | NA |
| Copper | 2.5E-06 | — | — | NA | — | — | — | - | — | | | | | | | NA |
| Dibenzo(a,h)anthracene | 4.6E-08 | — | — | NA | — | — | — | - | - | | | | | | | NA |
| 1,1 Dichloroethene | NA | — | — | NA | — | - | - | - | — | | | | | | | NA |
| 1,2 Dichloroethene | NA | — | — | NA | — | — | — | - | - | | | | | | | NA |
| Fluoranthene | 8.7E-08 | — | - | NA | | — | — | - | | - | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.2E-07 | — | — | NA | — | — | - | — | — | | | | | | | NA |
| Lithium | NA | - | — | NA | — | — | | | | | | - | | | | NA |
| Manganese | NA | — | | NA | | — | — | | | | | | | | | NA |
| Mercury | 1.1E-08 | | | NA | | - | - | | | | | | | | | N |
| Molybdenum | NA | | | NA | | | | | | | | | | | | NA |
| Nickel | NA | | | NA | | | | | | | | | | | | NA |
| Pyrene | 7.7E-08 | | | NA | | | | | - | | | | | | | NA |
| S i | 1.5E-07 | | | NA | | | | | | | | | | | | NA |
| St | NA | | | NA | | | | | | | | | | | | NA |
| T hl l | NA | | | NA | | | | | | | | | | | | NA |
| T hlo e h | NA | | | NA | | | | | - | | | | | | | NA |
| Vanadium | NA | | | NA | | | — | - | | — | | | | | | NA |
| Zinc | NA | | | 6.4E-06 | | | - | | | | | | | | | NA |
| Americium 241 | NA | | | NA | | | | | - | | | | | | | NA |
| Plutonium 239/240 | NA | — | - | NA | | — | - | | | | | | | | | NA |
| Radium 226 | NA | — | | NA | | | | | | | | | | | | NA |
| Uranium 233/234 | NA | — | — | NA | - | — | | — | — | | | | | | | NA |
| Uranium 235 | NA | — | — | NA | | — | — | - | — | | - | | | | | NA |
| Uranium 238 | NA | | — | NA | — | — | — | — | — | | - | | | | | NA |

Note: Radionuclide intakes are in units of pCi
— not an applicable pathway
NA = not a COC for this medium or no toxicity factor is available

## Table 6-68
## Construction Worker RME Noncarcinogenic Chemical Intakes for AOC2

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | — | — | | — | NA | NA | NA | | NA | | | | NA |
| Aluminum | NA | NA | — | | | | | NA | NA | NA | | NA | | | | NA |
| Antimony | NA | 2.7E-06 | — | | | | | NA | NA | NA | | NA | | | | NA |
| Aroclor-1254 | NA | NA | — | — | — | | | NA | NA | NA | | NA | | | | NA |
| Barium | NA | NA | — | — | — | | | NA | NA | NA | | NA | | | | NA |
| Benzo(a)anthracene | NA | NA | — | | | — | — | NA | NA | NA | | NA | | | | NA |
| Benzo(a)pyrene | 2.1E-07 | NA | — | | — | | | 5.4E-12 | NA | NA | | NA | | | | NA |
| Benzo(b)fluoranthene | 4.1E-09 | NA | — | — | | | | 4.5E-13 | NA | NA | | NA | | | | NA |
| Beryllium | NA | 3.7E-07 | — | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| Cadmium | NA | 7.1E-07 | — | — | | — | | NA | NA | 7.0E-08 | | NA | | | | NA |
| Copper | 1.0E-05 | 2.3E-06 | — | — | — | — | | 1.1E-12 | NA | NA | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 7.2E-09 | NA | — | — | — | — | | 7.3E-13 | NA | NA | | NA | | | | NA |
| 1,1 Dichloroethene | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| 1,2 Dichloroethene | NA | NA | | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| Fluoranthene | 2.5E-08 | NA | — | — | — | | — | 5.3E-12 | NA | NA | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.0E-06 | NA | | | — | | — | 1.1E-12 | NA | NA | | NA | | | | NA |
| Lithium | NA | NA | | | — | — | | NA | NA | NA | | NA | | | | NA |
| Manganese | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Mercury | 4.5E-08 | NA | | | | | | 4.7E-17 | NA | NA | | NA | | | | NA |
| Molybdenum | NA | 1.2E-05 | | | | | | NA | NA | NA | | NA | | | | NA |
| Nickel | NA | 1.3E-05 | | | | | | NA | NA | NA | | NA | | | | NA |
| Py[illegible] | 3.0E-08 | NA | | | | | | 6.2E-12 | NA | NA | | NA | | | | NA |
| [illegible] | 8.9E-07 | 2.4E-06 | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | N | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| T[illegible] | N | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| T[illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| V[illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Z[illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Americium 241 | NA | NA | | | | | | NA | NA | NA | | NA | — | | | NA |
| Plutonium-239/240 | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA |
| Radium 226 | NA | NA | — | — | — | | — | NA | NA | NA | | NA | | | | NA |
| Uranium 233/234 | NA | NA | — | — | — | | | NA | NA | NA | | NA | | | | NA |
| Uranium 235 | NA | NA | — | — | — | — | | NA | NA | NA | — | NA | | | | NA |
| Uranium 238 | NA | NA | — | | — | — | — | NA | NA | NA | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi

— not an applicable pathway

NA not a COC for this medium or no toxicity factor is available

Table 6-69
Current Worker RME Noncarcinogenic Chemical Intakes for AOC2

| Ch l f C nce | I g f S f ce Soil ( g/kg day) | Ing f S bs f ce Soil (mg/kg day) | Inge f Po d Sedim ts (mg/kg-day) | I g t f Seep Sedim ts (mg/kg-day) | I g f S re m Sedim ts (mg/kg-day) | I g f S f e W te (mg/kg day) | I ge ti f Seep W te (mg/kg-day) | I hal on f A bor P rt late (mg/kg-day) | D m l Abso p f Su face Soil (mg/kg day) | Dermal Abso p f S bs rf Soil (mg/kg day) | Dermal Abso p f P d Sed m (mg/kg-day) | De mal Abso pt f Se p Sed m ( g/kg day) | De al Abso p f S re Sed ( g/kg day) | D l Ab p f S f e W te ( g/k l y) | De ial Abso p f Se p W t ( g/kg day) | E R I F (y l l /g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aceton | NA | - | -- | - | -- | - | -- | NA | NA | | | | | | | |
| Al m m | NA | | -- | | | | | NA | NA | | | | | | | |
| Ant m y | NA | -- | -- | - | | | | NA | NA | | | | | | | NA |
| Aroclo 1254 | NA | - | -- | | | | | NA | NA | | | | | | | NA |
| Barium | NA | -- | -- | | | | | NA | NA | | | | | | | NA |
| Benzo( )a thrace | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | | | | | NA |
| Benzo( )pyrene | 1 8E-07 | -- | -- | -- | -- | | | NA | NA | | | | | | | NA |
| Benzo(b)fluor nthene | 3 6E-09 | -- | -- | -- | -- | -- | - | 2 7E-11 | NA | | - | | | | | NA |
| Beryll um | NA | - | -- | -- | -- | - | | 2.2E-12 | NA | | | | | | | NA |
| Cadm m | NA | -- | -- | -- | -- | -- | | NA | NA | | - | | | | | NA |
| Copper | 8 9E-06 | -- | -- | -- | -- | -- | -- | NA | NA | -- | | | | | | NA |
| Dibenzo( h)a thracene | 6 2E-09 | -- | -- | -- | -- | -- | -- | 5 3E-12 | NA | -- | | | | | | NA |
| 1,1 Dichloroethene | NA | -- | -- | -- | -- | -- | -- | 3 6E-12 | NA | - | | - | | | | NA |
| 1,2-Dichloroethene | NA | -- | -- | -- | -- | -- | -- | NA | NA | -- | | -- | | | | NA |
| Fluoranthene | 2.2E-08 | -- | -- | | -- | -- | - | NA | NA | | - | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 9.0E-09 | -- | -- | | -- | -- | - | 2.6E-11 | NA | - | | | | | | NA |
| Lithium | NA | - | | -- | - | - | -- | 5 2E-12 | NA | - | | | | | | NA |
| Mang nese | NA | | | | | | | NA | NA | | - | | | | | NA |
| M rcury | 3 9E-08 | | | -- | -- | | | NA | NA | | | | | | | NA |
| Molybden | NA | | | | - | -- | | 2.3E-16 | NA | - | | | | | | NA |
| N kel | NA | | | | | | | NA | NA | -- | | | | | | NA |
| Pyre e | 2 E-08 | | | | | | | NA | NA | | | | | | | NA |
| r | 7 7E 07 | | | | | | - | 3 1E-11 | NA | | | - | | | | NA |
| m | NA | | | | | | | NA | NA | - | | | | | | NA |
| T | NA | | | | | | | NA | NA | | | | | | | NA |
| T l e he | NA | | | | | | | NA | NA | | | | | | | NA |
| V adi m | NA | | | | | | | NA | NA | | | | | | | NA |
| Z | NA | - | - | | | | | NA | NA | | | | | | | NA |
| Ame ic n 241 | NA | -- | -- | | -- | - | -- | NA | NA | | | - | | | | NA |
| Pl toni m 239/240 | NA | -- | -- | -- | -- | | - | NA | NA | - | | | | | | NA |
| Radi m 226 | NA | -- | -- | -- | -- | -- | -- | NA | NA | | - | - | | | | NA |
| Urani m 233/234 | NA | -- | -- | | -- | -- | -- | NA | NA | - | | | | | | NA |
| Urani m 235 | NA | -- | -- | -- | -- | - | -- | NA | NA | -- | -- | - | | | | NA |
| Uranium 238 | NA | -- | -- | - | - | -- | - | NA | NA | -- | -- | -- | | | | NA |
| | | | | | | | | | | | | | | | | NA |

Not Radionuclide intak are in units f pCi
-- not pplicable pathway
NA not a COC for this medium r no toxicity factor is availabl

## Table 6-70
## Ecological Worker RME Noncarcinogenic Chemical Intakes for AOC2

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediment (mg/kg-day) | Ingestion of Stream Sed (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | -- | -- | NA | -- | -- | -- | NA | NA | | - | NA | | | | NA |
| Aluminum | NA | | -- | NA | -- | -- | | NA | NA | - | | NA | | -- | | NA |
| Antimony | NA | -- | -- | 5.9E-06 | -- | -- | | NA | NA | | | NA | | | | NA |
| Aroclor-1254 | NA | -- | - | NA | -- | | | NA | NA | | | NA | | | | NA |
| Barium | NA | -- | -- | NA | -- | | -- | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | -- | -- | NA | - | | - | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 1.0E-07 | -- | -- | NA | -- | -- | -- | 1.2E-11 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 2.0E-09 | -- | - | NA | -- | | | 9.7E-13 | NA | | | NA | | | | NA |
| Beryllium | NA | | -- | 2.0E-07 | | - | | NA | NA | | | NA | | | | NA |
| Cadmium | NA | - | -- | NA | | - | | NA | NA | | | NA | | | | NA |
| Copper | 4.9E-06 | | -- | NA | -- | | | 2.3E-12 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 3.4E-09 | - | -- | NA | | -- | -- | 1.6E-12 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | -- | | NA | | - | -- | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | -- | -- | NA | -- | - | | NA | NA | | -- | NA | | | | NA |
| Fluoranthene | 1.2E-08 | | -- | NA | | | | 1.1E-11 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 5.0E-09 | | - | NA | | -- | | 2.3E-12 | NA | | | NA | | | | NA |
| Lithium | NA | | - | NA | | | - | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Mercury | 2.2E-08 | | | NA | | | | 1.0E-16 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | - | | NA | NA | | | NA | | | | NA |
| [illegible] | 1.4E-08 | | | NA | | | | 1.4E-11 | NA | | | NA | | | | NA |
| [illegible] | 4.2E-07 | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | N[illegible] | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | - | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | 2.8E-04 | - | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | NA | | - | | NA | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | - | -- | NA | - | - | -- | NA | NA | -- | | NA | | | | NA |
| Radium 226 | NA | -- | -- | NA | -- | - | | NA | NA | | | NA | | | | NA |
| Uranium-233/234 | NA | | -- | NA | | -- | - | NA | NA | | - | NA | | | | NA |
| Uranium 235 | NA | | - | NA | | -- | -- | NA | NA | | | NA | | | | NA |
| Uranium 238 | NA | | -- | NA | | - | | NA | NA | | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi
-- = not applicable pathway
NA = not a COC for this medium or toxicity factor not available

## Table 6-71
## Office Worker RME Noncarcinogenic Chemical Intakes for AOC2

| l l f | I g f S f e So l ( g/kg l y | I ge f S bs f ce S l ( g/kg lay) | Inge f Pond Sed ( g/kg l y) | Inge tio f Se p Sed ( g/kg lay | I g f S re Sed ( g/kg l y | I g f S f W te ( g/kg l y) | I ge ti f Se p W te ( g/kg l y) | I hal f A bo P rt l ( g/kg l y) | De al Abso p f S f ce So l ( g/kg lay | Dermal Abso p f S b f S l ( g/kg l y | De mal Abso f I d Sed g/kg l y | D al Abs p f Se p Sed g/kg l y | D l Abso p f S Se l g/kg l y | D l Abs p f W te ( g/k l y | De l Al so Se W g/ g l y | F l I F y l l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Al mi m | NA | | — | | | | | NA | NA | | | NA | | | | NA |
| Ant mo y | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Aroclo 1254 | NA | | — | — | | | | NA | NA | | | NA | | | | NA |
| Bari m | NA | | — | — | | | - | NA | NA | | | NA | | | | NA |
| Benzo( )a th ace | NA | | - | | | | | NA | NA | | | NA | | | | NA |
| Benzo( )pyrene | 1 8E-07 | | | | | | | 2.7E-11 | NA | | | NA | | | | NA |
| Benzo(b)fl or he | 3 6E-09 | | — | — | | | | 2 2E-12 | NA | | | NA | | | | NA |
| Berylli m | NA | — | — | — | - | - | — | NA | NA | | — | NA | | | | NA |
| Cadmi m | NA | | — | — | — | — | | NA | NA | | | NA | | | | NA |
| Copper | 8 9E-06 | — | — | — | — | — | — | 5 3E-12 | NA | - | | NA | | | | NA |
| Dibenzo( h)anthracene | 6.2E-09 | — | - | — | — | — | — | 3 6E-12 | NA | — | | NA | | | | NA |
| 1,1 Dichloroethene | NA | - | — | — | | | | NA | NA | | | NA | | | | NA |
| 1,2 Dichloroethene | NA | - | | — | - | — | — | NA | NA | | | NA | | | | NA |
| Fluoranthene | 2 2E-08 | — | - | — | — | | - | 2 6E-11 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 9 0E-09 | — | | — | - | - | — | 5 2E-12 | NA | | | NA | | | | NA |
| Lithium | NA | - | — | — | | | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | — | | | - | NA | NA | | | NA | | | | NA |
| M rc ry | 3 9E-08 | | | | | | | 2 3E-16 | NA | | | NA | | | | NA |
| M lybde | NA | | | | | | | NA | NA | | | NA | | | | NA |
| N k l | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Py e | 2 6E 08 | | | | | | | 3 1E-11 | NA | | - | NA | | | | NA |
| Si | 7 7E 07 | | | | | | | NA | NA | | - | NA | | | | NA |
| | NA | | | | | — | | NA | NA | | | NA | | | | NA |
| T acl | NA | | | | | | | NA | NA | | | NA | | | | NA |
| T hl h e | NA | | | | | | | NA | NA | - | - | NA | | | | NA |
| V adi m | NA | | | | | — | | NA | NA | | | NA | | — | | NA |
| Z | NA | | | — | | | — | NA | NA | | — | NA | | | | NA |
| Ame m 241 | NA | — | — | — | | - | — | NA | NA | | | NA | | | | NA |
| Plutoni m 239/240 | NA | — | | | - | — | — | NA | NA | | | NA | | | | NA |
| Radi m 226 | NA | — | — | — | — | — | — | NA | NA | | - | NA | | | | NA |
| Uranium 233/234 | NA | — | - | — | — | - | — | NA | NA | — | — | NA | | | — | NA |
| Uranium 235 | NA | — | — | — | | — | — | NA | NA | - | - | NA | | | | NA |
| Urani m 238 | NA | — | — | — | | - | — | NA | NA | - | | NA | | | | NA |

Note Radi nuclide intake are in units f pCi
— = not an applicable pathw y
NA – not a COC for this medium or no toxicity factor i vail bl

**Table 6-72**
**Adult Open Space User RME Noncarcinogenic Chemical Intakes for AOC2**

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | Total [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | -- | -- | NA | | - | - | NA | NA | | | NA | | | | NA |
| Aluminum | NA | -- | -- | NA | - | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | - | | 1.1E-06 | -- | | | NA | NA | | | NA | | | | NA |
| Aroclor-1254 | NA | -- | -- | NA | | -- | -- | NA | NA | - | | NA | | | | NA |
| Barium | NA | | -- | NA | | -- | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | | - | NA | | - | -- | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 1.8E-08 | -- | -- | NA | -- | - | | 2.8E-12 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 3.6E-10 | | -- | NA | -- | -- | - | 2.3E-13 | NA | | | NA | | | | NA |
| Beryllium | NA | | -- | 3.7E-08 | -- | -- | | NA | NA | | | NA | | | | NA |
| Cadmium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Copper | 8.9E-07 | | -- | NA | | | | 5.6E-13 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 6.2E-10 | - | | NA | | -- | | 3.8E-13 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | - | -- | NA | | - | -- | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | | -- | NA | - | -- | -- | NA | NA | | | NA | | | | NA |
| Fluoranthene | 2.2E-09 | - | - | NA | | -- | - | 2.7E-12 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 9.0E-10 | -- | -- | NA | -- | -- | -- | 5.5E-13 | NA | - | | NA | | | | NA |
| Lithium | NA | | - | NA | - | -- | -- | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | | - | -- | NA | NA | | | NA | | | | NA |
| Mercury | 3.9E-09 | | | NA | | | | 2.4E-17 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | N |
| I y | 2.6E-09 | | | NA | | | - | 3.3E-12 | NA | | | NA | | | | NA |
| | 7.7E-08 | | | NA | | | | NA | NA | | | NA | | | | NA |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| I | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T i he | NA | | | NA | | - | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| / | NA | | | 5.1E-05 | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | NA | | -- | -- | NA | NA | | | NA | | | | NA |
| Radium 226 | NA | | -- | NA | -- | | - | NA | NA | | | NA | | | | NA |
| Uranium 233/234 | NA | | -- | NA | - | -- | | NA | NA | - | | NA | | | | NA |
| Uranium 235 | NA | | -- | NA | -- | | -- | NA | NA | | - | NA | | | | NA |
| Uranium 238 | NA | -- | | NA | | | | NA | NA | | | NA | | | | NA |

Note Radionuclide intakes are in units of pCi
-- not applicable pathway
NA not COC for this medium or toxicity factor not available

**Table 6-73**
**Child Open Space User RME Noncarcinogenic Chemical Intakes for AOC2**

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | -- | -- | NA | -- | | -- | -- | | | -- | - | | - | | NA |
| Aluminum | NA | | -- | NA | | | | -- | | | - | | | | | NA |
| Antimony | NA | | - | 1 0E-05 | | | - | -- | | | | | | | | NA |
| Aroclor 1254 | NA | | - | NA | | | - | | | | | | | | | NA |
| Barium | NA | | | NA | | | | | | | | | | | | NA |
| Benzo(a)anthracene | NA | | - | NA | | | - | | | | | | | | | NA |
| Benzo(a)pyrene | 1 7E-07 | - | - | NA | - | -- | - | -- | | | | | | | | NA |
| Benzo(b)fluoranthene | 3 4E-09 | - | | NA | -- | -- | - | -- | -- | | | | | | | NA |
| Beryllium | NA | - | -- | 3.4E-07 | | -- | -- | -- | | | | - | | | | NA |
| Cadmium | NA | -- | -- | NA | - | -- | -- | -- | | - | | | | | | NA |
| Copper | 6.3E-06 | -- | -- | NA | | -- | -- | -- | -- | | - | | | | | NA |
| Dibenzo(a,h)anthracene | 5 8E-09 | -- | - | NA | - | -- | - | - | | | | | | | | NA |
| 1 1 Dichloroethene | NA | -- | - | NA | -- | -- | -- | -- | | | | | | | | NA |
| 1 2-Dichloroethene | NA | -- | -- | NA | -- | -- | | -- | - | -- | - | - | | | | NA |
| Fluoranthene | 2.0E-08 | -- | -- | NA | -- | | -- | -- | -- | -- | | | | | | NA |
| Indeno(1 2,3-cd)pyrene | 8 4E-09 | -- | -- | NA | -- | - | -- | -- | | | | - | | | | NA |
| Lithium | NA | -- | | NA | -- | -- | -- | -- | -- | | - | | | | | NA |
| Manganese | NA | -- | -- | NA | | -- | -- | -- | - | | | | | | | NA |
| Mercury | 3 7E-08 | | -- | NA | | -- | -- | -- | -- | | | | | | | NA |
| Molybdenum | NA | | | NA | | | | | - | -- | | | | | | NA |
| Nickel | NA | | | NA | - | -- | | | | | | | | | | NA |
| Pyrene | 2 4E-08 | | | NA | | -- | | -- | | | | | | | | NA |
| Selenium | 7 2E-07 | | | NA | | | | - | | | | | | | | NA |
| Silver | NA | | | NA | | | | | | | | | | | | NA |
| Tetrachloroethene | NA | | | NA | | | | | | - | -- | | | | | NA |
| Thallium | NA | | | NA | | | | | - | | | | | | | NA |
| Vanadium | NA | | | NA | | - | | - | | | - | | | | | NA |
| Zinc | NA | | | 4.8E-04 | | - | - | -- | | -- | | -- | | | | NA |
| Americium 241 | NA | -- | -- | NA | | -- | -- | -- | | - | -- | | | | | NA |
| Plutonium 239/240 | NA | -- | -- | NA | - | -- | -- | -- | | -- | -- | | | | - | NA |
| Radium 226 | NA | -- | -- | NA | -- | -- | -- | -- | -- | -- | | -- | -- | - | | NA |
| Uranium-233/234 | NA | -- | -- | NA | -- | -- | -- | -- | -- | - | | -- | - | - | | NA |
| Uranium 235 | NA | -- | -- | NA | -- | -- | -- | -- | -- | -- | -- | | - | | | NA |
| Uranium 238 | NA | - | -- | NA | - | -- | -- | -- | -- | -- | | -- | - | - | | NA |

Note Radionuclide intakes are in units of pCi
-- not an applicable pathway
NA not a COC for this medium no toxicity factor is available

## Table 6-74
## Construction Worker CT Noncarcinogenic Chemical Intakes for AOC2

| Chem als of C ncern | Inge ti f Surface Soil (mg/kg-day) | Inge tio f Subsurface Soil (mg/kg day) | Ingestio of Po d Sedimen ts (mg/kg-day) | Ingesti f Seep Sedime ts (mg/kg-day) | Ingestio f Stream Sedim ts (mg/kg-day) | Inge ti f S rface W te (mg/kg day) | Ingestio of Seep W ter (mg/kg-day) | I halation of Airborne Partic late (mg/kg-day) | Dermal Absorption f Surface So l (mg/kg-day) | Dermal Absorptio of Subsurface Soil (mg/kg day) | Dermal Absorptio f Pond Sedimen (mg/kg-day) | Dermal Absorptio of Se p Sedim (mg/kg-day) | De m l Abso ptio f Stre Sedi (mg/kg day | De mal Absorptio f S rface W te (mg/kg day) | Der al Abs ptio f Se p W t (mg/kg-day | F al Rad io F sure y (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | - | — | — | - | NA | NA | NA | | NA | | | | NA |
| Aluminum | NA | NA | — | — | | - | | NA | NA | NA | | NA | | | | NA |
| Ant mony | NA | 4 8E-07 | - | - | - | — | | NA | NA | NA | | NA | | | | NA |
| Aroclor 1254 | NA | NA | - | - | - | | | NA | NA | NA | | NA | | | | NA |
| Barium | NA | NA | | - | - | | | NA | NA | NA | | NA | | - | | NA |
| Benzo(a)a thracene | NA | NA | | | - | | | NA | NA | NA | | NA | | | | NA |
| Benzo( )pyrene | 3 8E-08 | NA | | | | | | 4 4E-12 | NA | NA | | NA | | | | NA |
| Benzo(b)fluoranthene | 7 4E-10 | NA | - | — | — | - | | 3 6E-13 | NA | NA | | NA | | | | NA |
| Beryll m | NA | 6 5E-08 | | | | — | | NA | NA | NA | | NA | | | | NA |
| Cadmium | NA | 1 3E-07 | | | | | | NA | NA | NA | | NA | | | | NA |
| Copper | 1 8E-06 | 4 1E-06 | | | | | | 8 6E 13 | NA | 1 1E-08 | | NA | | | | NA |
| D benzo( )a I acene | 1 3E 09 | NA | | | | | | 5 8E 13 | NA | NA | | NA | | | | NA |
| 1,1 Dichloroethene | NA | NA | | - | — | — | - | NA | NA | NA | | NA | | - | | NA |
| 1,2 Dichloroethene | NA | NA | | — | | — | — | NA | NA | NA | | NA | | | | NA |
| Fluoranthene | 4 5E-09 | NA | - | - | — | — | — | 4 2E-12 | NA | NA | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1 9E-09 | NA | - | — | — | — | — | 8 5E-13 | NA | NA | | NA | | | | NA |
| Lithi m | NA | NA | - | | - | - | | NA | NA | NA | | NA | | | | NA |
| M ng nese | NA | NA | | — | - | | — | NA | NA | NA | - | NA | | | | NA |
| M rc ry | 8 0E-09 | NA | | — | | — | | 3 7E-17 | NA | NA | - | NA | | | | NA |
| M lybde n | NA | 2 2E-06 | | | | | - | NA | NA | NA | | NA | | | | NA |
| N k l | NA | 2 3E-06 | | | | | - | NA | NA | NA | | NA | | | | NA |
| Pyre | 5 4E | NA | | | - | | | 5 0E 12 | NA | NA | | NA | | | | NA |
| [illegible] | 1 6E 7 | 3E 7 | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| [illegible] | NA | NA | | | | | | NA | NA | NA | - | NA | | | | NA |
| Z | NA | NA | | | - | | | NA | NA | NA | | NA | | | | NA |
| Americ m 241 | NA | NA | | - | — | | — | NA | NA | NA | | NA | | | | NA |
| Pl to m 239/240 | NA | NA | | — | | - | - | NA | NA | NA | | NA | | | | NA |
| Radi m 226 | NA | NA | - | — | — | - | | NA | NA | NA | - | NA | | | | NA |
| Urani m 233/234 | NA | NA | | - | | | — | NA | NA | NA | | NA | | | | NA |
| Urani m 235 | NA | NA | | — | | | | NA | NA | NA | - | NA | | | | NA |
| Urani m 238 | NA | NA | - | - | | - | - | NA | NA | NA | | NA | | | | NA |

Note Radionuclid take re nit of pC
not an pplic ble p thw y
NA not COC fo hi med m no tox y facto l bl

# Table 6-75
## Current Worker CT Noncarcinogenic Chemical Intakes for AOC2

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediment (mg/kg-day) | Ingestion of Spring Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Spring Sediment (mg/kg-day) | Dermal Absorption of Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | - | -- | | | - | -- | NA | NA | | | -- | | | | NA |
| Aluminum | NA | | - | | | | | NA | NA | | | | | | | NA |
| Antimony | NA | -- | | | | | | NA | NA | | | | | | | NA |
| Aroclor 1254 | NA | | -- | - | | | -- | NA | NA | | | | | | | NA |
| Barium | NA | -- | -- | | | | - | NA | NA | | | | | | | NA |
| Benzo(a)anthracene | NA | | -- | | | | | NA | NA | | | | | | | N |
| Benzo(a)pyrene | 2.88E-08 | | | - | | | | 2.12E-11 | NA | | | | | | | NA |
| Benzo(b)fluoranthene | 5.67E-10 | -- | - | | | | - | 1.74E-12 | NA | | | | | | | NA |
| Beryllium | NA | -- | -- | -- | -- | -- | | NA | NA | | | | | | | NA |
| Cadmium | NA | -- | | -- | -- | -- | -- | NA | NA | | | - | | | | NA |
| Copper | 1.40E-06 | -- | -- | -- | -- | - | | 4.17E-12 | NA | | | | | | | NA |
| Dibenzo(a,h)anthracene | 9.80E-10 | -- | - | -- | - | -- | -- | 2.83E-12 | NA | | | | | | | NA |
| 1,1-Dichloroethene | NA | | | | -- | -- | | NA | NA | | | | | | | NA |
| 1,2-Dichloroethene | NA | -- | | -- | -- | | | NA | NA | | | | | | | NA |
| Fluoranthene | 3.44E-09 | | -- | -- | -- | - | | 2.06E-11 | NA | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.42E-09 | - | -- | -- | | - | - | 4.11E-12 | NA | - | | | | | | NA |
| Lithium | NA | - | | -- | -- | | | NA | NA | | | | | | | NA |
| Manganese | NA | | | - | | | | NA | NA | | - | - | | | | NA |
| Mercury | 6.17E-09 | | | | | - | | 1.82E-16 | NA | | | | | | | NA |
| Molybdenum | NA | | | | | -- | | NA | NA | - | | | | | | NA |
| Nickel | NA | | | | | | | NA | NA | | | | | | | NA |
| [illegible] | 4.13E-[illegible] | | | | | | | 2.43E-11 | NA | | | | | | | NA |
| | 1.22E-07 | | | | | | | NA | NA | | | | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| Thallium | NA | | | | | | | NA | NA | | | | | | | NA |
| Vanadium | NA | | | | | | | NA | NA | | | | | | | NA |
| Zinc | NA | | | | | | | NA | NA | | -- | -- | | | | NA |
| Americium 241 | NA | -- | - | -- | | -- | - | NA | NA | | | | | | | NA |
| Plutonium 239/240 | NA | -- | | -- | - | -- | -- | NA | NA | | | - | | | | NA |
| Radium 226 | NA | -- | -- | -- | -- | -- | -- | NA | NA | - | - | -- | | | | NA |
| Uranium 233/234 | NA | -- | - | -- | -- | -- | - | NA | NA | -- | | - | | | | NA |
| Uranium 235 | NA | -- | -- | -- | -- | -- | -- | NA | NA | -- | | -- | -- | | | NA |
| Uranium 238 | NA | -- | - | -- | -- | -- | -- | NA | NA | | | -- | | | | NA |

Note: Radionuclide intakes are in units of pCi
-- not an applicable pathway
NA not COC for this medium or no toxicity factor is available

## Table 6-76
## Ecological Worker CT Noncarcinogenic Chemical Intakes for AOC2

| Chem al f C ncern | I g io f Su face Soil (mg/kg-d y) | I ge io f Subs rf ce Soil (mg/kg day) | Inge f Pond Sediments (mg/kg-day) | I ge tio f Se p Sedim ts (mg/kg-day | Ing f Stre m Sediments (mg/kg-day) | I ge f S rface W te (mg/kg day) | I ge o Se p Wate (mg/kg-day) | I hal tio f A rbor e Partic lates (mg/kg day) | De mal Abso pt i S face So l (mg/kg-day) | Dermal Abs p f S b fac S l (mg/kg lay) | Dermal Absorp io f P d Sedimen (mg/kg lay | Dermal Abs pt f Se Sedim (mg/kg-day) | De l Abso p f St Sed t (mg/kg day) | De t al Abs p f f W te (mg/kg lay) | D al Abs p Se p W t ( g/kg lay | I I Exp re y p pt i/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Al m num | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Ant mony | NA | | | 1 6E-06 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Ba um | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)a thracene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 2 8E-08 | | | NA | | | | 6 3E-12 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 5 5E-10 | | | NA | | | | 5 2E-13 | NA | | | NA | | | | NA |
| Beryll m | NA | | | 5 7E-08 | | | | NA | NA | | | NA | | | | NA |
| Cadmi m | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Copper | 1 4E-06 | | | NA | | | | 1 2E-12 | NA | | | NA | | | | NA |
| Dibenzo( h)anthracene | 9 6E-10 | | | NA | | | | 8 4E-13 | NA | | | NA | | | | NA |
| 1 1 Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| 1 2 Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Fluora thene | 3 4E-09 | | | NA | | | | 6 1E-12 | NA | | | NA | | | | NA |
| Indeno(1 2,3-cd)pyrene | 1 4E-09 | | | NA | | | | 1 2E-12 | NA | | | NA | | | | NA |
| Li hi m | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| M nganese | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| M rc ry | 6 0E-09 | | | NA | | | | 5 4E-17 | NA | | | NA | | | | NA |
| M lybde | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| N k l | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| I › | 4 0E 0 | | | NA | | | | 7 2E-12 | NA | | | NA | | | | NA |
| S | 1 2E 7 | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| I a | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| f h e | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| a | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Z | NA | | | 7 9E-05 | | | | NA | NA | | | NA | | | | NA |
| Americ m 241 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Pl ton m 239/240 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Radi m 226 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uran m 233/234 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Urani 235 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Uran m 238 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |

Note Radionuclide take are nits of pC
ot pplicable pathway
NA not COC fo hi med m no tox ty facto table.

## Table 6-77

## Office Worker CT Noncarcinogenic Chemical Intakes for AOC2

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Barium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 1.4E-08 | | | | | | | 1.6E-11 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 2.8E-10 | | | | | | | 1.3E-12 | NA | | | NA | | | | NA |
| Beryllium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Cadmium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Copper | 7.0E-07 | | | | | | | 3.2E-12 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 4.9E-10 | | | | | | | 2.1E-12 | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Fluoranthene | 1.7E-09 | | | | | | | 1.6E-11 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 7.1E-10 | | | | | | | 3.1E-12 | NA | | | NA | | | | NA |
| Lithium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Mercury | 3.1E-09 | | | | | | | 1.4E-16 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Pyrene | 2.1E- | | | | | | | 1.8E-11 | NA | | | NA | | | | NA |
| Selenium | 6.1E-08 | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Trichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Radium 226 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Uranium 233/234 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Uranium 235 | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Uranium 238 | NA | | | | | | | NA | NA | | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi.
-- not applicable pathway
NA not COC for this medium or no toxicity factor is available.

## Table 6-78

### Adult Open Space User CT Noncarcinogenic Chemical Intakes for AOC2

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | Total Route Exposure (mg/kg-day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | — | NA | — | — | — | NA | NA | | - | NA | | | | NA |
| Aluminum | NA | - | — | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | — | 2.1E-07 | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | | — | NA | | | | NA | NA | | | NA | | | | NA |
| Barium | NA | - | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 3.7E-10 | | | NA | | | | 2.0E-13 | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 7.2E-11 | | — | NA | - | | | 1.7E-14 | NA | | | NA | | | | NA |
| Beryllium | NA | | | 7.3E-09 | — | | — | NA | NA | | | NA | | | | NA |
| Cadmium | NA | — | — | NA | — | - | | NA | NA | | | NA | | | | NA |
| Copper | 1.8E-07 | - | - | NA | | — | | 4.0E-14 | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 1.2E-10 | - | | NA | | | | 2.7E-14 | NA | | | NA | | | | NA |
| 1,1 Dichloroethene | NA | — | — | NA | | - | | NA | NA | | | NA | | | | NA |
| 1,2 Dichloroethene | NA | — | | NA | | - | — | NA | NA | | | NA | | | | NA |
| Fluoranthene | 4.4E-10 | | | NA | | | — | 2.0E-13 | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1.8E-10 | | | NA | | | | 3.9E-14 | NA | | | NA | | | | NA |
| Lithium | NA | | - | NA | — | - | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | - | | | NA | NA | | | NA | | | | NA |
| Mercury | 7.8E-10 | | | NA | | | | 1.7E-18 | NA | | | NA | | | | NA |
| Molybdenum | NA | | | NA | | | | NA | NA | - | | NA | | | | NA |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Pyrene | 5.2E-1[illegible] | | | NA | - | | | 2.3E-13 | NA | | | NA | | | | NA |
| [illegible] | 1.5E-08 | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | N[illegible] | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| V[illegible] | NA | | | NA | | | - | NA | NA | | | NA | | | | NA |
| Z[illegible] | NA | | | 1.0E-05 | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | NA | — | — | | NA | NA | | | NA | | | | NA |
| Radium 226 | NA | | | NA | — | | — | NA | NA | | - | NA | - | | | NA |
| Uranium 233/234 | NA | - | — | NA | — | — | | NA | NA | | | NA | | | | NA |
| Uranium 235 | NA | - | | NA | | | | NA | NA | | | NA | | | | NA |
| Uranium 238 | NA | - | | NA | | | — | NA | NA | | | NA | | | | NA |

Note: Radionuclide intakes are in units of pCi
— not applicable pathway
NA no COC for this medium or no toxicity factor available

**Table 6-79**

**Child Open Space User CT Noncarcinogenic Chemical Intakes for AOC2**

| Che l f C | Ing f S face So l ( g/kg-day) | Inge f S bs f ce Soil (mg/kg day) | I ge f P d Sedim ts (mg/kg day) | Inge f Se p Sedim ts (mg/kg-day) | I ge f S re Sed ts (mg/kg-day) | I ge f S rf ce W te (mg/kg day) | I ge f Seep W te (mg/kg-day) | I hal f A rbor P rt l te (mg/kg day) | De mal Abso p f S face So l (mg/kg-day) | De mal Abso p f S bs f ce So l (mg/kg day) | De mal Abso p o f l d Sed m (mg/kg-day) | De mal Abso pt o f Se p Sedi ( g/kg-day) | D l Abso p f S re Sedi n (mg/kg day) | D mal Abso p f S f c W te (mg/kg d y) | D l Abso p f Se p W (mg/kg lay) | F l l a l F l y l /g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | — | NA | - | | | — | - | | | | | | | NA |
| Al m m | NA | | — | NA | | | | | | | | | | | | NA |
| An mo y | NA | | | 2.0E-06 | | | | | | | | | | | | NA |
| Aroclo 1254 | NA | - | - | NA | | | | | | | | | | | | NA |
| Ba m | NA | | | NA | | - | - | | | | | | | | | NA |
| Benzo( )a th acene | NA | - | | NA | - | - | - | | | | | | | | | NA |
| Benzo( )pyrei | 3 4E-08 | | — | NA | | | - | | | | | | | | | NA |
| Benzo(b)fl or hene | 6.7E-10 | - | | NA | - | | | - | | | | | | | | NA |
| Beryllium | NA | — | - | 6 8E-08 | — | - | - | | | | | | | | | NA |
| Cadmium | NA | - | — | NA | — | - | - | | | | | | | | | NA |
| Copper | 1 7E-06 | — | | NA | — | — | - | — | - | | | | | | | NA |
| Dibenzo( h) thracene | 1 2E-09 | | | NA | — | — | - | - | - | | | | | | | NA |
| 1 1 Dichloroethene | NA | | — | NA | — | | | | | | - | — | | | | NA |
| 1,2 Dichloroethene | NA | | — | NA | — | — | - | - | — | | - | | | | | NA |
| Fluoranthene | 4 1E-09 | | — | NA | — | — | | | - | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1 7E-09 | - | - | NA | — | — | | — | | | | | | | | NA |
| Lithi m | NA | | | NA | — | | | — | | | | | | | | NA |
| Manganese | NA | - | | NA | — | | — | - | | | | - | | | | NA |
| M rcury | 7 3E-09 | - | | NA | — | | | | | | | | | | | NA |
| M lybde | NA | | | NA | - | | | | | | | | | | | NA |
| N k l | NA | | | NA | | | | | | | | | | | | NA |
| Pyre e | 4 9E-09 | | | NA | | | - | — | | | | - | | | | NA |
| S | 1 4E 07 | | | NA | | | - | | — | | | | | | | NA |
| S | NA | | | NA | | | | | | | | | | | | NA |
| T | NA | | | NA | | | | | | | | | | | | NA |
| T | NA | | | NA | | | | | | | | | | | | NA |
| V adi m | NA | | | NA | | | | | | | | | | | | NA |
| Z | NA | | | 9 6E-05 | - | | — | — | - | | | | | | | NA |
| Americ 241 | NA | — | - | NA | — | - | | — | - | | | - | | | | NA |
| Plutoni m 239/240 | NA | — | | NA | — | — | — | — | — | | | — | | | | NA |
| Radi m 226 | NA | — | — | NA | — | — | - | — | — | — | — | — | | | — | NA |
| Urani m 233/234 | NA | — | - | NA | — | — | — | — | — | — | — | | — | | | NA |
| Urani m 235 | NA | — | - | NA | — | — | — | — | — | | — | — | | | | NA |
| Urani m 238 | NA | — | — | NA | — | | — | — | — | | - | | | | | NA |

Note Radionuclide take re in units of pCi
not an pplicable pathway
NA not COC for this medium or no toxicity factor is ailable.

## Table 6-80
## Ecological Worker RME Noncarcinogenic Chemical Intakes for AOC3

| Chemic l of Concern | Inge io f Su face Soil (mg/kg-day) | I ge f Subs rface Soil (mg/kg day) | Ingestio f Pond Sediments (mg/kg-day) | Ingesti f Seep Sedim ts (mg/kg-day) | I ge ti f Stre m Sediments (mg/kg-day) | Inge io f S rface W te (mg/kg day) | I ge o f Seep W te (mg/kg-day) | Inhal ion f Airborne P rtic late (mg/kg-day) | De mal Abs rption f Su face So l (mg/kg-day) | Dermal Absorptio f S bs rface Soil (mg/kg day) | Dermal Absorptio f Pond Sedimer t (mg/kg-day) | Dermal Absorptio f Seep Sedim (mg/kg-day) | De mal Absorptio f S re Sedi mg/kg-d y | [illegible] Abso ptio f S rface W te ( g/kg day) | De al bso p i Se p W (n g/kg day) | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | - | | NA | - | NA | NA | - | - | | | NA | | NA | NA | | NA |
| Al minum | | | NA | - | NA | NA | | | | | NA | | NA | NA | | NA |
| Antimony | - | | NA | - | NA | NA | | | | | NA | | NA | NA | | NA |
| Aroclor 1254 | | - | NA | - | NA | NA | | - | | | NA | | NA | NA | | NA |
| Barium | | | NA | - | NA | 2 4E-06 | - | - | | | NA | | NA | NA | | NA |
| Benz( )a thracene | | | NA | - | NA | NA | - | - | | | NA | | NA | NA | | NA |
| Benzo(a)pyrene | | - | NA | - | NA | NA | | - | | | NA | | NA | NA | | NA |
| Benzo(b)fluoranthene | | | NA | - | NA | NA | - | - | | | NA | | NA | NA | | NA |
| Beryll um | | | NA | - | NA | NA | | - | | | NA | | NA | NA | | NA |
| Cadmi m | | | NA | - | NA | NA | | | | - | NA | | NA | NA | | NA |
| Copper | | | NA | - | 5 8E-05 | NA | - | | | | NA | | NA | NA | | NA |
| D benzo( h)a thracene | - | | NA | - | NA | NA | | - | | | NA | | NA | NA | | NA |
| 1 1 Dichloroethene | - | - | NA | - | NA | NA | - | - | | - | NA | | NA | NA | | NA |
| 1 2 Dichloroethene | | | NA | - | NA | NA | - | - | | | NA | | NA | NA | | NA |
| Fluoranthene | | - | NA | - | NA | NA | - | - | | - | NA | | NA | NA | | NA |
| Inde o(1 2,3-cd)pyrene | - | | NA | - | NA | NA | | - | | | NA | | NA | NA | | NA |
| I hi m | | | NA | - | NA | 5 2E-07 | - | - | | - | NA | | NA | NA | | NA |
| M nganese | | | NA | - | NA | NA | | | | | NA | | NA | NA | | NA |
| M rc ry | | | NA | | 5 9E-07 | NA | - | | | | NA | | NA | NA | | NA |
| M lylde m | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| N l | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| I y | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| I | | | NA | | NA | 7 2E-06 | | | | | NA | | NA | NA | | NA |
| I | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| d m | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Z | | | NA | | 1 6E-04 | NA | | | | | NA | | NA | NA | | NA |
| Am u 241 | | | NA | | NA | NA | - | | | | NA | | NA | NA | | NA |
| Pl ton m 239/240 | - | - | NA | - | NA | NA | | | | | NA | | NA | NA | | NA |
| Radi m 226 | | | NA | - | NA | NA | - | | - | - | NA | | NA | NA | | NA |
| Urani m 233/234 | | | NA | | NA | NA | | | | | NA | - | NA | NA | | NA |
| Urani m 235 | - | - | NA | - | NA | NA | - | - | | | NA | | NA | NA | | NA |

Note Radio uclide take re ni of pC
an pplicable pathw y
NA not COC fo hi med m no tox ty facto l bl

## Table 6-81
## Adult Open Space User RME Noncarcinogenic Chemical Intakes for AOC3

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Irradiation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | | NA | | NA | NA | — | | | | NA | | NA | NA | | N |
| Aluminum | | | NA | | NA | NA | — | | | | NA | — | NA | NA | | NA |
| Antimony | | — | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Aroclor 1254 | | — | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Barium | | | NA | | NA | 3.0E-06 | — | — | | | NA | | NA | NA | | NA |
| Benzo(a)anthracene | | | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Benzo(a)pyrene | | | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Benzo(b)fluoranthene | | | NA | — | NA | NA | | — | | | NA | | NA | NA | | NA |
| Beryllium | | — | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Cadmium | — | — | NA | — | NA | NA | | | | — | NA | | NA | NA | | NA |
| Copper | | — | NA | — | 1.1E-05 | NA | — | — | — | — | NA | | NA | NA | | NA |
| Dibenzo(a,h)anthracene | | — | NA | | NA | NA | — | | — | — | NA | | NA | NA | | NA |
| 1,1-Dichloroethene | | — | NA | — | NA | NA | — | | | | NA | | NA | NA | | NA |
| 1,2-Dichloroethene | — | — | NA | | NA | NA | — | — | | | NA | | NA | NA | | NA |
| Fluoranthene | | — | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Indeno(1,2,3-cd)pyrene | | | NA | — | NA | NA | — | | | | NA | | NA | NA | | NA |
| Lithium | | — | NA | — | NA | 6.5E-07 | — | | | | NA | | NA | NA | | NA |
| Manganese | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Mercury | | | NA | | 1.1E-07 | NA | — | | | | NA | | NA | NA | | NA |
| Molybdenum | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Pyrene | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| [illegible] | — | | NA | | NA | NA | | | | — | NA | | NA | NA | | NA |
| [illegible] | — | | NA | | NA | 9.0E-06 | | | | | NA | — | NA | NA | | NA |
| [illegible] | — | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Vanadium | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Zinc | | | NA | | 2.9E-05 | NA | | | | | NA | | NA | NA | | NA |
| Americium 241 | | | NA | | NA | NA | | — | | | NA | | NA | NA | | NA |
| Plutonium 239/240 | — | — | NA | — | NA | NA | — | — | | | NA | | NA | NA | | NA |
| Radium 226 | | — | NA | — | NA | NA | — | — | | | NA | | NA | NA | | NA |
| Uranium 233/234 | | — | NA | — | NA | NA | — | — | — | — | NA | | NA | NA | | NA |
| Uranium 235 | — | — | NA | — | NA | NA | — | — | — | — | NA | | NA | NA | | NA |
| Uranium 238 | — | — | NA | — | NA | NA | — | — | — | | NA | — | NA | NA | | NA |

Note Radionuclide intakes are in units of pCi
— not an applicable pathway
NA not COC for this medium no toxicity factor is available.

## Table 6-82
## Child Open Space User RME Noncarcinogenic Chemical Intakes for AOC3

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | — | | NA | — | NA | | | — | — | — | — | | | | | NA |
| Aluminum | | | NA | — | NA | — | | | | | | | | | | NA |
| Antimony | | | NA | | NA | | | — | | | | | | | | NA |
| Aroclor-1254 | | | NA | — | NA | — | | — | | | — | | | | | NA |
| Barium | | — | NA | — | NA | — | — | — | — | | | — | | | | NA |
| Benzo(a)anthracene | | — | NA | — | NA | — | — | | | | — | | | | | NA |
| Benzo(a)pyrene | — | | NA | — | NA | — | | — | | | — | — | | | | NA |
| Benzo(b)fluoranthene | — | — | NA | — | NA | — | | — | — | | — | | | | | NA |
| Beryllium | — | — | NA | — | NA | — | — | — | — | | — | | | | | NA |
| Cadmium | | — | NA | — | NA | — | — | | — | — | — | | | | | NA |
| Copper | | — | NA | — | 9 9E-05 | — | | — | — | | | | | | | NA |
| Dibenzo(a,h)anthracene | — | | NA | — | NA | — | — | — | | — | — | | | | | NA |
| 1,1 Dichloroethene | — | — | NA | — | NA | — | — | | | | — | | | | | NA |
| 1,2 Dichloroethene | — | — | NA | — | NA | — | — | | | | — | | | | | NA |
| Fluoranthene | | — | NA | — | NA | — | — | — | | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | | — | NA | | NA | | — | — | | | | | | | | NA |
| Lithium | | | NA | | NA | | | | | | | | | | | NA |
| Manganese | | | NA | | NA | | | | | | | | | | | NA |
| Mercury | | | NA | | 1 0E-06 | — | | | | | | | | | | NA |
| Molybdenum | | | NA | | NA | — | | | | | | | | | | NA |
| Nickel | | | NA | | NA | — | | | | | — | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| Vanad[illegible] | | | NA | | NA | | | | | | | | | | | NA |
| Z[illegible] | | | NA | — | 2 7E-04 | | | | | | | | | | | NA |
| Americium 241 | | | NA | — | NA | | — | — | | | | | | | | NA |
| Plutonium 239/240 | — | | NA | — | NA | — | | — | — | — | — | | | | | NA |
| Radium 226 | — | — | NA | — | NA | — | — | | | — | — | | | | | NA |
| Uranium 233/234 | — | — | NA | — | NA | | | | | — | | | | | | NA |
| Uranium 235 | — | | NA | | NA | — | | | — | — | — | | | | | NA |
| Uranium 238 | | | NA | | NA | | | | | | | | | | | NA |

N te Radio lide take are nits of pC
ot pplicable p thw y
NA no COC fo thi med m no toxic ty facto labl

**Table 6-83**

**Ecological Worker CT Noncarcinogenic Chemical Intakes for AOC3**

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediment (mg/kg-day) | Dermal Absorption of Seep Sediment (mg/kg-day) | Dermal Absorption of Stream Sediment (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | - | NA | — | NA | NA | — | — | — | | NA | | NA | NA | | NA |
| Aluminum | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Antimony | | | NA | - | NA | NA | | | | | NA | | NA | NA | | NA |
| Aroclor 1254 | | — | NA | | NA | NA | | - | - | | NA | - | NA | NA | | NA |
| Barium | — | — | NA | — | NA | 1.4E-06 | | | | | NA | | NA | NA | | NA |
| Benzo(a)anthracene | | | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Benzo(a)pyrene | | | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Benzo(b)fluoranthene | | - | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Beryllium | — | | NA | — | NA | NA | | | - | | NA | | NA | NA | | NA |
| Cadmium | — | — | NA | — | NA | NA | - | | | | NA | | NA | NA | | NA |
| Copper | | | NA | — | 1.6E-05 | NA | - | - | | | NA | | NA | NA | | NA |
| Dibenzo(a,h)anthracene | | — | NA | - | NA | NA | — | | | | NA | | NA | NA | | NA |
| 1,1-Dichloroethene | — | — | NA | — | NA | NA | | - | | | NA | | NA | NA | | NA |
| 1,2-Dichloroethene | | — | NA | — | NA | NA | - | | | | NA | | NA | NA | | NA |
| Fluoranthene | | | NA | — | NA | NA | - | | | | NA | | NA | NA | | NA |
| Indeno(1,2,3-cd)pyrene | - | — | NA | - | NA | NA | | | | | NA | | NA | NA | | NA |
| Lithium | | — | NA | — | NA | 3.0E-07 | - | — | | | NA | | NA | NA | | NA |
| Manganese | | | NA | - | NA | NA | | - | | | NA | | NA | NA | | NA |
| Mercury | | | NA | — | 1.7E-07 | NA | — | | | | NA | | NA | NA | | NA |
| Molybdenum | | | NA | | NA | NA | - | - | | | NA | | NA | NA | | NA |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Pyrene | | | NA | | NA | NA | | | | | NA | | NA | NA | | N |
| [illegible] | | | NA | | NA | NA | | | | | NA | - | NA | NA | | NA |
| [illegible] | | | NA | | NA | 4.2E-06 | | | | | NA | - | NA | NA | | NA |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| [illegible] | | | NA | | NA | NA | | | | | NA | — | NA | NA | | NA |
| Vanadium | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| [illegible] | | | NA | | 4.5E-05 | NA | | | | | NA | | NA | NA | | NA |
| Americium 241 | | | NA | | NA | NA | | - | | | NA | - | NA | NA | | NA |
| Plutonium 239/240 | — | | NA | - | NA | NA | | — | | | NA | | NA | NA | | NA |
| Radium 226 | | — | NA | — | NA | NA | - | - | | | NA | | NA | NA | | NA |
| Uranium 233/234 | — | — | NA | — | NA | NA | | — | | - | NA | | NA | NA | | NA |
| Uranium 235 | — | — | NA | — | NA | NA | | — | — | | NA | | NA | NA | | NA |
| Uranium 238 | — | — | NA | — | NA | NA | — | — | — | — | NA | - | NA | NA | - | NA |

Note: Radionuclide intakes are in units of pCi.
— = not an applicable pathway.
NA = not a COC for this medium or no toxicity factors available.

# Table 6-84

## Adult Open Space User CT Noncarcinogenic Chemical Intakes for AOC3

| Chemicals of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulate (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | External Radiation Exposure (y pCi/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | — | — | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Aluminum | | | NA | - | NA | NA | | — | - | — | NA | - | NA | NA | | NA |
| Antimony | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Aroclo 1254 | | | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Barium | - | — | NA | — | NA | 5.1E-07 | | | | | NA | | NA | NA | | NA |
| Benzo( )anthracene | — | — | NA | - | NA | NA | - | — | | | NA | | NA | NA | | NA |
| Benzo( )pyrene | - | | NA | - | NA | NA | - | - | | | NA | — | NA | NA | | NA |
| Benzo(b)fluoranthen | - | | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Beryllium | - | — | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Cadmium | — | - | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Copper | - | — | NA | — | 2.1E-06 | NA | - | - | | | NA | | NA | NA | | NA |
| Dibenzo( ,h)anthracen | | — | NA | | NA | NA | | — | | | NA | | NA | NA | | NA |
| 1,1 Dichloroethene | | - | NA | — | NA | NA | | - | | | NA | | NA | NA | | NA |
| 1,2 Dichloroethene | | - | NA | — | NA | NA | | | | | NA | - | NA | NA | | NA |
| Fluoranthene | | — | NA | | NA | NA | | - | - | | NA | | NA | NA | | NA |
| Indeno(1,2,3-cd)pyrene | — | | NA | | NA | NA | | — | — | | NA | | NA | NA | | NA |
| Lithium | — | | NA | | NA | 1.1E-07 | - | - | | | NA | | NA | NA | | NA |
| Manganese | | | NA | - | NA | NA | - | | | | NA | | NA | NA | | NA |
| Mercury | | | NA | | 2.2E-08 | NA | | — | | | NA | | NA | NA | | NA |
| Molybdenum | | | NA | - | NA | NA | | — | - | — | NA | - | NA | NA | | NA |
| N k l | | | NA | | NA | NA | | - | | | NA | | NA | NA | | NA |
| l y | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| h | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| Stro | | | NA | | NA | 1.5E-06 | | | | | NA | | NA | NA | | NA |
| T a l he | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA |
| T h | | | NA | | NA | NA | | | - | | NA | | NA | NA | | NA |
| V nadi m | | | NA | | NA | NA | | | — | | NA | | NA | NA | | NA |
| Z | | | NA | | 5.9E-06 | NA | | | | | NA | | NA | NA | | NA |
| Ame m 241 | | — | NA | — | NA | NA | | | | | NA | | NA | NA | | NA |
| Pl ton m 239/240 | — | - | NA | | NA | NA | — | - | - | | NA | | NA | NA | | NA |
| Radi m 226 | | | NA | - | NA | NA | | - | — | | NA | | NA | NA | | NA |
| Uran m 233/234 | — | - | NA | - | NA | NA | — | — | — | | NA | - | NA | NA | | NA |
| Uran m 235 | - | — | NA | — | NA | NA | - | - | - | - | NA | | NA | NA | | NA |
| Uranium 238 | | | NA | — | NA | NA | — | — | — | | NA | - | NA | NA | | NA |

Note Radi uclide take are nits of pC
ot pplicable pathw y
NA not COC fo thi medium no toxici y facto ailable

## Table 6-85

## Child Open Space User CT Noncarcinogenic Chemical Intakes for AOC3

| Chemical of Concern | Ingestion of Surface Soil (mg/kg-day) | Ingestion of Subsurface Soil (mg/kg-day) | Ingestion of Pond Sediments (mg/kg-day) | Ingestion of Seep Sediments (mg/kg-day) | Ingestion of Stream Sediments (mg/kg-day) | Ingestion of Surface Water (mg/kg-day) | Ingestion of Seep Water (mg/kg-day) | Inhalation of Airborne Particulates (mg/kg-day) | Dermal Absorption of Surface Soil (mg/kg-day) | Dermal Absorption of Subsurface Soil (mg/kg-day) | Dermal Absorption of Pond Sediments (mg/kg-day) | Dermal Absorption of Seep Sediments (mg/kg-day) | Dermal Absorption of Stream Sediments (mg/kg-day) | Dermal Absorption of Surface Water (mg/kg-day) | Dermal Absorption of Seep Water (mg/kg-day) | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | — | NA | — | NA | | — | — | — | | | | | | | NA |
| Aluminum | | | NA | — | NA | | — | | | | | | | | | NA |
| Antimony | | | NA | — | NA | | | | | | | | | | | NA |
| Aroclor 1254 | | — | NA | — | NA | — | | | — | | | | | | | NA |
| Barium | | — | NA | — | NA | — | | | | | | | | | | NA |
| Benzo(a)anthracene | | — | NA | — | NA | — | | | | | | | | | | NA |
| Benzo(a)pyrene | | | NA | — | NA | | — | | | | | | | | | NA |
| Benzo(b)fluoranthene | | — | NA | — | NA | | — | — | — | | | | | | | NA |
| Beryllium | — | — | NA | — | NA | — | — | | | | | | | | | NA |
| Cadmium | — | | NA | — | NA | — | — | — | | | | | | | | NA |
| Copper | | — | NA | — | 5.7E-06 | — | — | — | | | | | | | | NA |
| Dibenzo(a,h)anthracene | | | NA | — | NA | — | | | | | | | | | | NA |
| 1,1-Dichloroethene | | | NA | — | NA | | | — | | | | | | | | NA |
| 1,2-Dichloroethene | — | | NA | — | NA | — | — | — | — | | | | | | | NA |
| Fluoranthene | | — | NA | — | NA | — | — | | — | | | | | | | NA |
| Indeno(1,2,3-cd)pyrene | — | — | NA | — | NA | — | | — | — | | | | | | — | NA |
| Lithium | — | — | NA | — | NA | — | — | — | — | | | | | | | NA |
| Manganese | | | NA | — | NA | — | | | — | | | | | | | NA |
| Mercury | | | NA | | 5.7E-08 | — | | | — | | | | | | | NA |
| Molybdenum | | | NA | | NA | | | | | | — | | | | | NA |
| Nickel | | | NA | | NA | | | | | | | | | | | N |
| Pyrene | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| [illegible] | | | NA | | NA | | | | | | | | | | | NA |
| Vanadium | | | NA | | NA | — | | | | | | | | | | NA |
| Zinc | | | NA | | 1.6E-05 | — | | | | | | | | | | NA |
| Americium 241 | | — | NA | | NA | | | | | | | | | | | NA |
| Plutonium 239/240 | | — | NA | — | NA | — | | — | | | | | | | | NA |
| Radium 226 | | — | NA | — | NA | — | | | | | | | | | | NA |
| Uranium 233/234 | — | | NA | — | NA | | — | — | — | | | | | | | NA |
| Uranium 235 | — | — | NA | — | NA | — | | — | | | | | | | | NA |
| Uranium 238 | — | — | NA | — | NA | — | — | — | — | | — | | | | | NA |

Note: Radionuclide intakes are in units of pCi.
— not applicable pathway
NA not COC for this medium or no toxicity factor available.

**Table 6-86**
**Carcinogen Groups**

| Weight of Evidence | Description |
|---|---|
| A | Human Carcinogen (sufficient evidence of carcinogenicity in humans) |
| B | Probable Human Carcinogen (B1 limited evidence of carcinogenicity in humans B2 sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans) |
| C | Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data) |
| D | Not Classifiable as to Human Carcinogenicity (inadequate or no evidence) |
| E | Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies) |

**Table 6-87**

**Construction Worker RME Carcinogenic Risk Factors for AOC1**

| Ch l f C nce n | I g f S rf ce So l | I ge f S bs rface So l | I ge f Pond Sedim nts | I ge ti f Se p Sedim | I g f Stre m Sedim | I g f S f ce W te | I ge f Se p W te | I hal f Airbor P rt l te | Dermal Abso p f S f e So l | Dermal Abso pt f S bs fac So l | De m l Abso ptio f P d Sed | De al Abso pt f Se p Sed | De l Abso p f Stre Sed m t | De m l Abso pt f S f e W te | De l Abso p f Se p W t | I x l Ra l Exp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Al m m | NA | NA | — | | - | | | NA | NA | NA | | NA | | | | NA |
| A m y | NA | NA | – | | | | - | NA | NA | NA | | NA | | | | NA |
| Aroclo 1254 | 1 9E-08 | 6 5E-09 | | - | | | | NA | 2 2E-08 | 7 7E-09 | | NA | | | | NA |
| Bari m | NA | NA | — | | — | | | NA | NA | NA | | NA | | | | NA |
| Be zo( )a th cen | 6 3E-09 | 6 8E-09 | — | - | | | | NA | NA | NA | | NA | | | | NA |
| Benzo( )pyren | 4 8E-08 | 6 4E-08 | | | | | | NA | NA | NA | | NA | | | | NA |
| Be zo(b)fl or nthe | 6 4E-09 | 7 1E-09 | | | | | | NA | NA | NA | | NA | | | | NA |
| Beryll m | NA | 1 4E-08 | – | — | | — | | NA | NA | NA | | NA | | | | NA |
| Cadm m | NA | NA | - | — | - | — | | NA | NA | NA | | NA | | | | NA |
| Copper | NA | NA | | - | — | — | | NA | NA | NA | | NA | | | | NA |
| D benzo( h)a thracene | 2.9E-08 | NA | — | — | | – | - | NA | NA | NA | | NA | | | | NA |
| 1 1 D hloroeth ne | NA | NA | — | — | — | | — | NA | NA | NA | | NA | | | | NA |
| 1 2 D hloroethene | NA | NA | – | — | – | – | – | NA | NA | NA | | NA | - | | | NA |
| Fl o a th | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| I de o(1 2 3-cd)pyre e | 8 0E-09 | NA | | | | – | | NA | NA | NA | | NA | | | – | NA |
| L thi m | NA | NA | - | | | – | | NA | NA | NA | | NA | | | – | NA |
| Mang nese | NA | NA | — | — | | – | | NA | NA | NA | | NA | | | | NA |
| M rc ry | NA | NA | | — | — | - | - | NA | NA | NA | | NA | | | | NA |
| M lybde m | NA | NA | | — | | | - | NA | NA | NA | | NA | | | | NA |
| N k l | NA | NA | | | — | – | | NA | NA | NA | | NA | | | | NA |
| Pyre | NA | NA | | | - | | | NA | NA | NA | | NA | — | | | NA |
| S l | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| T hl h | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| T l h | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| V adi | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA |
| Z | NA | NA | | | | | | NA | NA | NA | | NA | | – | | NA |
| A 241 | NA | NA | | | | | | 1 4E-13 | NA | NA | | NA | | | | NA |
| Pl m 239/240 | NA | NA | | | | | | 5 8E-13 | NA | NA | | NA | | - | | NA |
| Radi m 226 | NA | NA | – | — | | – | - | NA | NA | NA | | NA | - | - | | NA |
| Urani m 233/234 | 2.2E-09 | 3 9E-10 | — | — | – | — | | 5.1E-10 | NA | NA | | NA | | | | 1 2E-11 |
| Urani m 235 | 6.3E-10 | 3.0E-11 | — | — | — | — | – | 1 1E-10 | NA | NA | — | NA | | — | | 2 0E-08 |
| Urani m 238 | 2.3E-08 | 4 5E-10 | - | ~ | — | — | — | 6 0E-09 | NA | NA | - | NA | — | | | 1 2E-07 |
| | Risks by pathw y | | | | | | | | | | | | | | | |
| | 1 4E-07 | 9 9E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 0E+00 | 0 0E+00 | 6.6E-09 | 2.2E-08 | 7 7E-09 | 0.0E+00 | 0 0E+00 | 0.0E+00 | 0.0E+00 | 0 0E+00 | 1 4E-07 |

— not an applicable pathway

NA not a COC for this medium or no toxicity factor is vailabl

Table 6-98
Curent Worker RME Carcinogenic Risk Factors for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | - | -- | -- | | | | NA | NA | -- | | | | | | NA |
| Aluminum | NA | - | -- | | -- | - | -- | NA | NA | | | | | | | NA |
| Antimony | NA | -- | -- | | | -- | - | NA | NA | | | - | -- | | | NA |
| Aroclor-1254 | 4 1E-07 | -- | -- | -- | -- | -- | -- | NA | 3.4E-06 | | | -- | | - | | NA |
| Barium | NA | -- | -- | -- | -- | -- | -- | NA | NA | -- | -- | | | - | | NA |
| Benzo(a)anthracene | 1 4E-07 | -- | -- | | - | - | - | NA | NA | | | | | | | NA |
| Benzo(a)pyrene | 1 0E-06 | -- | -- | | | | -- | NA | NA | | | | | | | NA |
| Benzo(b)fluoranthene | 1 4E-07 | - | -- | -- | - | -- | | NA | NA | | - | | | | | NA |
| Beryllium | NA | -- | -- | - | -- | -- | -- | NA | NA | | | | | | | NA |
| Cadmium | NA | -- | -- | - | -- | - | -- | NA | NA | -- | -- | -- | | - | | NA |
| Copper | NA | -- | -- | -- | -- | - | -- | NA | NA | | | | | - | | NA |
| Dibenzo(a,h)anthracene | 6 4E-07 | -- | -- | -- | -- | - | -- | NA | NA | | -- | | | | | NA |
| 1 1 Dichloroethene | NA | -- | - | -- | -- | -- | -- | NA | NA | - | | | | | | NA |
| 1 2-Dichloroethene | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | -- | | | | NA |
| Fluoranthene | NA | -- | -- | -- | -- | -- | | NA | NA | | | | | | | NA |
| Indeno(1,2 3-cd)pyrene | 1 7E-07 | | | | | | | NA | NA | -- | -- | -- | | | | NA |
| Lithium | NA | | | -- | | | | NA | NA | | | | | | | NA |
| Manganese | NA | | | -- | -- | | - | NA | NA | | | | | | | NA |
| Mercury | NA | | | | -- | | | NA | NA | | | | | | | NA |
| Molybdenum | NA | | | | | - | | NA | NA | | | | | | | NA |
| Nickel | NA | | | | | | | NA | NA | | | | | | | NA |
| Pyrene | NA | | | | | | | NA | NA | | | | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | -- | | | - | | | NA |
| T[illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| V[illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| Z[illegible] | NA | | | | | | | NA | NA | | | | | | | NA |
| Americium 241 | NA | | - | | - | | - | 1 8E-11 | NA | - | | | | | | NA |
| Plutonium 239/240 | NA | -- | -- | -- | -- | -- | -- | 7 1E-11 | NA | | | - | | | | NA |
| Radium 226 | NA | - | -- | -- | -- | - | -- | NA | NA | -- | - | | | -- | | NA |
| Uranium 233/234 | 4 8E-08 | -- | - | | -- | - | -- | 6 2E-06 | NA | | | | | | | 1 7E-09 |
| Uranium 235 | 1 4E-08 | -- | | - | | - | - | 1 4E-06 | NA | | | | | | | 2 7E-06 |
| Uranium 238 | 5 1E-07 | -- | -- | -- | -- | -- | | 7 4E-07 | NA | | - | | | | | 1 7E-05 |
| | | | | | | | | Risk by pathway | | | | | | | | |
| | 3 1E-06 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 8 2E-07 | 3 4E-06 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 2 0E-05 |
| | Total risk | 2 7E-05 | | | | | | | | | | | | | | |

-- not [illegible] applicable pathway
NA not a COC for this medium or no toxicity factor available

Table 6-89
Ecological Worker RME Carcinogenic Risk Factors for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | Total Risk by Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | | — | NA | NA | | | NA | — | | | NA |
| Aluminum | NA | — | — | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | — | — | NA | | — | — | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 2.3E-08 | — | — | NA | | — | | NA | 1.2E-07 | | | NA | | | | NA |
| Barium | NA | — | — | NA | | — | — | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 7.6E-09 | — | — | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 5.8E-08 | | — | NA | | | — | NA | NA | | — | NA | | | | NA |
| Benzo(b)fluoranthene | 7.7E-09 | — | — | NA | — | — | — | NA | NA | — | | NA | | | | NA |
| Beryllium | NA | — | — | 3.5E-08 | — | — | — | NA | NA | | | NA | | | | NA |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | | | NA |
| Copper | NA | — | — | NA | — | | — | NA | NA | | — | NA | | | | NA |
| Dibenzo(a,h)anthracene | 3.5E-08 | — | — | NA | — | — | | NA | NA | | | NA | — | | | NA |
| 1,1-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | | | NA | — | | | NA |
| 1,2-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | | | NA |
| Fluoranthene | NA | — | — | NA | — | — | — | NA | NA | | — | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 9.6E-09 | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Lithium | NA | — | — | NA | — | — | — | NA | NA | | — | NA | | | | NA |
| Manganese | NA | — | — | NA | — | — | — | NA | NA | | | NA | — | | | NA |
| Mercury | NA | — | — | NA | — | — | — | NA | NA | | | NA | — | | | NA |
| Molybdenum | NA | | | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | — | — | | NA | NA | | | NA | | | | NA |
| Pyrene | NA | | | NA | | — | — | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | — | | NA | | | | NA |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Tetrachloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Trichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | NA | | | | NA | NA | | — | NA | — | — | | NA |
| Americium 241 | NA | — | — | NA | | | — | 7.7E-13 | NA | — | — | NA | | | | NA |
| Plutonium 239/240 | NA | — | — | NA | — | — | — | 3.1E-12 | NA | | — | NA | | | | NA |
| Radium 226 | NA | — | — | NA | | — | — | NA | NA | — | — | NA | | — | | NA |
| Uranium 233/234 | 2.6E-09 | — | — | 3.9E-10 | — | — | — | 2.7E-09 | NA | | — | NA | | — | | 6.0E-11 |
| Uranium 235 | 7.5E-10 | — | — | 3.0E-11 | — | — | | 6.0E-10 | NA | — | — | NA | — | | | 9.8E-08 |
| Uranium 238 | 2.8E-08 | — | — | 4.1E-10 | — | — | — | 3.3E-08 | NA | — | — | NA | — | | | 6.2E-07 |
| | Risks by pathway | | | | | | | | | | | | | | | |
| | 1.7E-07 | 0.0E+00 | 0.0E+00 | 3.6E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.6E-08 | 1.2E-07 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 7.2E-07 |
| | Total risk: | 1.1E-06 | | | | | | | | | | | | | | |

— not an applicable pathway

NA not a COC for this medium / no toxicity factor is available

## Table 6-90
## Office Worker RME Carcinogenic Risk Factors for AOC1

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | - | — | — | — | — | NA | NA | - | — | NA | | — | | NA |
| Aluminum | NA | — | — | — | — | — | — | NA | NA | | - | NA | | | | NA |
| Antimony | NA | — | — | — | — | - | | NA | NA | — | — | NA | | | | NA |
| Aroclor-1254 | 4 1E-07 | — | — | — | — | — | | NA | 2.1E-06 | — | | NA | | — | | NA |
| Barium | NA | - | — | — | - | - | — | NA | NA | — | - | NA | | | | NA |
| Benzo(a)anthracene | 1 4E-07 | | — | — | — | — | — | NA | NA | | — | NA | | - | | NA |
| Benzo(a)pyrene | 1 0E-06 | - | — | — | — | — | - | NA | NA | - | | NA | | | | NA |
| Benzo(b)fluoranthene | 1 4E-07 | — | — | — | — | - | — | NA | NA | - | - | NA | - | - | | NA |
| Beryllium | NA | — | — | — | — | — | — | NA | NA | | | NA | - | | | NA |
| Cadmium | NA | — | — | — | — | — | — | NA | NA | | — | NA | | | - | NA |
| Copper | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 6 4E-07 | — | — | — | — | — | — | NA | NA | | - | NA | | | | NA |
| 1,1 Dichloroethene | NA | — | - | — | — | — | — | NA | NA | | | NA | | | | NA |
| 1,2 Dichloroethene | NA | - | | — | — | — | — | NA | NA | | - | NA | | | | NA |
| Fluoranthene | NA | | | — | — | — | — | NA | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 1 7E-07 | | — | — | — | — | - | NA | NA | | | NA | | | | NA |
| Lithium | NA | — | — | — | — | — | - | NA | NA | | | NA | | | | NA |
| Manganese | NA | | - | — | | — | | NA | NA | | | NA | | | | NA |
| Mercury | NA | — | | - | — | | — | NA | NA | | - | NA | | | | NA |
| Molybdenum | NA | | | — | — | | | NA | NA | — | | NA | | | | NA |
| Nickel | NA | | | - | | - | | NA | NA | | - | NA | | | | NA |
| Pyrene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Silver | NA | | | | | | | NA | NA | | | NA | | | | NA |
| | NA | | | | | | | NA | NA | | | NA | | | | NA |
| T [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| T [illegible] | NA | | | | | | | NA | NA | | — | NA | | | | NA |
| Vanadium | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | | | | | NA | NA | | - | NA | | | | NA |
| Americium 241 | NA | | | | — | — | - | 1.8E-11 | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | — | | — | — | — | — | 7 1E-11 | NA | - | | NA | | | | NA |
| Radium 226 | NA | — | | — | — | — | — | NA | NA | | — | NA | | | | NA |
| Uranium 233/234 | 4 8E-08 | - | — | — | | — | — | 6 2E-08 | NA | - | - | NA | - | | | 1 7E-09 |
| Uranium 235 | 1 4E-08 | - | | — | - | — | — | 1 4E-08 | NA | - | — | NA | | | | 2 7E-06 |
| Uranium 238 | 5 1E-07 | — | - | — | — | - | - | 7 4E-07 | NA | | — | NA | | | | 1 7E-05 |
| | Risks by pathway | | | | | | | | | | | | | | | |
| | 3 1E-06 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 8 2E-07 | 2.1E-06 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 2 0E-05 |
| | | | | | | | | | | | | | | | | |
| | Total risk | 2 6E-05 | | | | | | | | | | | | | | |

— not an applicable pathway

NA not COC for this medium or no toxicity factor available

## Table 6-91
## Open Space User RME Carcinogenic Risk Factors for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sed | Dermal Absorption of Seep Sed | Dermal Absorption of Stream Sed | Dermal Absorption of Surface W | Dermal Absorption of Seep W | External Rad |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | — | NA | — | | — | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | — | NA | | | | NA | NA | | | NA | | | | NA |
| Ar[illegible] | NA | — | — | NA | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | 4.0E-08 | — | — | NA | | | — | NA | 6.3E-07 | | | NA | | | | NA |
| Barium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | 1.3E-08 | | — | NA | — | | — | NA | NA | | — | NA | | | | NA |
| Benzo(a)pyrene | 1.0E-07 | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 1.3E-08 | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Beryllium | NA | — | | 6.1E-08 | | | | NA | NA | | | NA | | | | NA |
| Cadmium | NA | | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Copper | NA | — | — | NA | — | — | — | NA | NA | | — | NA | | | | NA |
| Dibenzo(a,h)anthracene | 6.1E-08 | — | — | NA | — | — | — | NA | NA | — | — | NA | | | | NA |
| 1,1-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | | | NA |
| 1,2-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | | — | NA | | | — | NA |
| Fluoranthene | NA | | — | NA | — | — | — | NA | NA | — | | NA | | | — | NA |
| Indeno(1,2,3-cd)pyrene | 1.7E-08 | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Lithium | NA | — | — | NA | — | | — | NA | NA | | — | NA | | | | NA |
| Manganese | NA | — | — | NA | — | | — | NA | NA | — | | NA | | | | NA |
| Mercury | NA | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| Molybdenum | NA | | — | NA | — | — | — | NA | NA | | — | NA | | | | NA |
| Nickel | NA | | — | NA | | — | | NA | NA | | — | NA | | | | NA |
| Pyrene | NA | | | NA | | | — | NA | NA | | — | NA | | | | NA |
| Silver | NA | | | NA | | — | — | NA | NA | | — | NA | | — | | NA |
| S[illegible] | NA | | | NA | | | — | NA | NA | — | — | NA | | — | | NA |
| Tetrachloroethene | NA | | | NA | | | | NA | NA | | — | NA | | | | NA |
| Trichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | — | NA | NA | | | NA | | | | NA |
| Zinc | NA | | | NA | | — | — | NA | NA | | — | NA | | — | | NA |
| Americium 241 | NA | | | NA | | | — | 2.2E-12 | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | — | NA | — | — | — | 9.0E-12 | NA | | — | NA | | | | NA |
| Radium 226 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | | | NA |
| Uranium 233/234 | 4.6E-09 | — | — | 6.7E-10 | — | — | — | 7.9E-09 | NA | — | — | NA | | | | 2.4E-1 |
| Uranium 235 | 1.3E-09 | — | — | 5.3E-11 | — | — | — | 1.7E-09 | NA | — | — | NA | — | | | 3.9E-07 |
| Uranium 238 | 4.9E-08 | — | — | 7.2E-10 | — | — | — | 9.4E-08 | NA | — | — | NA | — | — | — | 2.5E-06 |
| | Risks by pathway | | | | | | | | | | | | | | | |
| | 3.0E-07 | 0.0E+00 | 0.0E+00 | 6.3E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.0E-07 | 6.3E-07 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 2.9E-06 |
| | Total risk | 4.0E-06 | | | | | | | | | | | | | | |

— = not an applicable pathway

NA = not a COC for this medium or no toxicity factor is available

## Table 6-92
## Construction Worker CT Carcinogenic Risk Factors for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | - | NA | - | | | NA | 0 0E+00 |
| Aluminum | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | - | | -- | NA | 0 0E+00 |
| Antimony | NA | NA | | -- | -- | - | | NA | NA | NA | | NA | - | | | NA | 0 0E+00 |
| Aroclor-1254 | 3 4E-09 | 1 2E-09 | -- | -- | -- | -- | -- | NA | 4 0E-09 | 1 4E-09 | | NA | | | | NA | 1 0E-08 |
| Barium | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | -- | | -- | NA | 0 0E+00 |
| Benzo(a)anthracene | 1 1E-09 | 1.2E-09 | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | | | -- | NA | 2 3E-09 |
| Benzo(a)pyrene | 8 6E-09 | 1 1E-08 | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | -- | | -- | NA | 2 0E-08 |
| Benzo(b)fluoranthene | 1 1E-09 | 1.3E-09 | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | | | NA | 2 4E-09 |
| Beryllium | NA | 2.4E-09 | -- | -- | -- | -- | -- | NA | NA | NA | | NA | - | | | NA | 2 4E-09 |
| Cadmium | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | -- | - | | NA | 0 0E+00 |
| Copper | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | | | -- | NA | 0 0E+00 |
| Dibenzo(a,h)anthracene | 5.2E-09 | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | | - | NA | 5 2E-09 |
| 1,1 Dichloroethene | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | -- | | | NA | 0 0E+00 |
| 1 2-Dichloroethene | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Fluoranthene | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Indeno(1,2,3-cd)pyrene | 1 4E-09 | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | -- | | | NA | 1 4E-09 |
| Lithium | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Manganese | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | -- | | NA | 0 0E+00 |
| Mercury | NA | NA | - | - | -- | -- | | NA | NA | NA | -- | NA | | | | NA | 0 0E+00 |
| Molybdenum | NA | NA | - | -- | -- | -- | -- | NA | NA | NA | | NA | | | -- | NA | 0 0E+00 |
| Nickel | NA | NA | | -- | -- | | | NA | NA | NA | - | NA | - | | | NA | 0 0E+00 |
| Pyrene | NA | NA | | | -- | - | -- | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Silver | NA | NA | - | | -- | -- | -- | NA | NA | NA | - | NA | -- | - | | NA | 0 0E+00 |
| Strontium | NA | NA | | | - | -- | -- | NA | NA | NA | -- | NA | -- | -- | | NA | 0 0E+00 |
| Tetrachloroethene | NA | NA | | | - | -- | - | NA | NA | NA | | NA | -- | | | NA | 0 0E+00 |
| Trichloroethene | NA | NA | | | | | -- | NA | NA | NA | - | NA | -- | - | | NA | 0 0E+00 |
| Vanadium | NA | NA | | | - | -- | -- | NA | NA | NA | - | NA | -- | | | NA | 0 0E+00 |
| Zinc | NA | NA | | | -- | -- | -- | NA | NA | NA | | NA | -- | | | NA | 0 0E+00 |
| Americium 241 | NA | NA | | | -- | -- | -- | 1 1E-13 | NA | NA | -- | NA | -- | | | NA | 1 1E-13 |
| Plutonium 239/240 | NA | NA | - | -- | -- | -- | -- | 4 6E-13 | NA | NA | | NA | -- | | -- | NA | 4 6E-13 |
| Radium-226 | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | - | -- | - | NA | 0 0E+00 |
| Uranium 233/234 | 3 9E-10 | 6.9E-11 | -- | - | -- | -- | -- | 4 1E-10 | NA | NA | - | NA | - | -- | -- | 9 6E-12 | 8 8E-10 |
| Uranium 235 | 1 1E-10 | 5.3E-12 | -- | -- | -- | -- | -- | 8 9E-11 | NA | NA | - | NA | -- | | - | 1 6E-08 | 1 6E-08 |
| Uranium 238 | 4 2E-09 | 8 0E-11 | -- | -- | -- | | -- | 4.8E-09 | NA | NA | - | NA | | - | | 1 0E-07 | 1 1E-07 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 2 6E-08 | 1 8E-08 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 5 3E-09 | 4 0E-09 | 1 4E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 1 2E-07 | |
| | | | | | | | | | | | | | | | | | |
| | Total risk | 1 7E-07 | | | | | | | | | | | | | | | |

-- not applicable pathway

NA not a COC for this medium or toxicity factor not available

# Table 6-93
## Current Worker CT Carcinogenic Risk Factors for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | — | — | — | | NA | NA | — | — | - | — | | — | NA | 0.0E+00 |
| Aluminum | NA | — | — | — | | | — | NA | NA | | | | | | | NA | 0.0E+00 |
| Antimony | NA | — | — | — | — | | | NA | NA | | | — | | | | NA | 0.0E+00 |
| Aroclor 1254 | 1.0E-08 | — | — | — | — | - | — | NA | 8.5E-08 | | | | - | | | NA | 9.5E-08 |
| Barium | NA | — | — | — | — | — | — | NA | NA | — | - | — | - | | | NA | 0.0E+00 |
| Benzo(a)anthracene | 3.5E-09 | — | — | — | — | — | — | NA | NA | — | | — | — | | | NA | 3.5E-09 |
| Benzo(a)pyrene | 2.6E-08 | - | — | — | — | - | — | NA | NA | — | | | | | | NA | 2.6E-08 |
| Benzo(b)fluoranthene | 3.5E-09 | — | — | — | — | — | — | NA | NA | — | | | - | | | NA | 3.5E-09 |
| Beryllium | NA | — | — | — | — | — | — | NA | NA | — | - | | | | | NA | 0.0E+00 |
| Cadmium | NA | — | — | — | — | — | — | NA | NA | — | | | | | - | NA | 0.0E+00 |
| Copper | NA | — | — | — | — | — | — | NA | NA | — | | | | | | NA | 0.0E+00 |
| Dibenzo(a,h)anthracene | 1.6E-08 | — | — | — | — | — | — | NA | NA | — | | - | | | | NA | 1.6E-08 |
| 1,1 Dichloroethene | NA | — | — | — | — | — | — | NA | NA | — | - | | | | | NA | 0.0E+00 |
| 1,2 Dichloroethene | NA | — | — | — | — | — | — | NA | NA | — | — | — | - | - | | NA | 0.0E+00 |
| Fluoranthene | NA | — | - | — | — | — | — | NA | NA | — | | | | | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | 4.4E-09 | — | — | — | — | — | — | NA | NA | — | | — | | — | | NA | 4.4E-09 |
| Lithium | NA | — | — | — | — | — | — | NA | NA | — | — | — | - | - | | NA | 0.0E+00 |
| Manganese | NA | — | — | — | — | — | — | NA | NA | — | | - | - | | | NA | 0.0E+00 |
| Mercury | NA | — | - | — | — | — | — | NA | NA | — | — | - | — | — | | NA | 0.0E+00 |
| Molybdenum | NA | - | | — | — | — | — | NA | NA | | | — | — | | | NA | 0.0E+00 |
| Nickel | NA | — | — | — | — | — | — | NA | NA | - | — | | | | — | NA | 0.0E+00 |
| Pyrene | NA | — | | | | — | — | NA | NA | — | | — | - | — | | NA | 0.0E+00 |
| Silver | NA | | - | - | — | - | — | NA | NA | - | - | | — | | | NA | 0.0E+00 |
| Strontium | NA | | - | - | — | - | — | NA | NA | — | - | - | - | | | NA | 0.0E+00 |
| Tetrachloroethene | NA | | | | — | — | | NA | NA | — | - | - | | | | NA | 0.0E+00 |
| Trichloroethene | NA | | - | - | — | — | | NA | NA | - | - | | | | | NA | 0.0E+00 |
| Vanadium | NA | | - | | — | - | — | NA | NA | | — | | — | | — | NA | 0.0E+00 |
| Zinc | NA | - | | | — | — | - | NA | NA | - | — | - | | - | | NA | 0.0E+00 |
| Americium 241 | NA | — | — | — | — | — | — | 2.2E-12 | NA | — | - | - | - | | | NA | 2.2E-12 |
| Plutonium 239/240 | NA | — | — | — | — | — | — | 9.0E-12 | NA | — | — | — | — | - | | NA | 9.0E-12 |
| Radium 226 | NA | — | — | — | — | — | — | NA | NA | — | — | — | | — | | NA | 0.0E+00 |
| Uranium 233/234 | 1.2E-09 | — | — | — | — | — | — | 7.9E-09 | NA | — | — | — | | — | — | NA | 9.2E-09 |
| Uranium 235 | 3.4E-10 | — | — | — | — | — | — | 1.7E-09 | NA | — | — | — | - | — | - | 1.4E-10 | 9.2E-09 |
| Uranium 238 | 1.3E-08 | — | — | — | — | — | — | 9.4E-08 | NA | — | — | — | — | - | | 2.4E-07 | 2.4E-07 |
| | Risks by pathway | | | | | | | | | | | | | — | — | 1.5E-06 | 1.6E-06 |
| | 7.9E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.0E-07 | 8.5E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.7E-06 | |
| | Total risk: | 2.0E-06 | | | | | | | | | | | | | | | |

— not an applicable pathway

NA not a COC for this medium or no toxicity factor is available

## Table 6-94
## Ecological Worker CT Noncarcinogenic HIs for AOC1

| Chem  als of Concern | Ingestio  f Surface Soil | Ingestio of Subsurface So l | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestio of Surface W te | Ingestio of Seep W te | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorptio f Subsurface So l | Dermal Absorption of Pond Sediments | Dermal Absorptio of Seep Sedime ts | Dermal Absorptio of Stream Sediments | Dermal Absorptio of Surface W te | Dermal Absorptio f Seep W te | External Rad tio Exposure | T tal Risk by Ch m l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | — | — | NA | NA | — | - | NA | | | — | NA | |
| Aluminum | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Antimony | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Aroclor-1254 | 6.4E-09 | — | — | NA | — | — | — | NA | 2.2E-08 | — | — | NA | — | — | — | NA | 0 0E 00 |
| Barium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 2 8E-08 |
| Benzo(a)anthracene | 2 1E-09 | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Benzo(a)pyrene | 1.6E-08 | — | — | NA | — | — | — | NA | NA | — | — | NA | — | | — | NA | 2 1E 09 |
| Benzo(b)fluoranthene | 2.2E-09 | — | — | NA | — | — | — | NA | NA | — | — | NA | — | - | — | NA | 1 6E-08 |
| Beryllium | NA | — | — | 9.9E-09 | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 2 2E-09 |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 9 9E-09 |
| Copper | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Dibenzo(a,h)anthracene | 9 9E-09 | — | — | NA | — | - | — | NA | NA | - | — | NA | — | — | — | NA | 0 0E+00 |
| 1,1 Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | — | - | NA | 9 9E-09 |
| 1,2-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | | NA | — | — | | NA | 0 0E 00 |
| Fluoranthene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Indeno(1,2,3-cd)pyrene | 2.7E-09 | — | — | NA | — | — | — | NA | NA | — | - | NA | — | — | — | NA | 0 0E+00 |
| Lithi m | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 2 7E-09 |
| Manganese | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | - | - | | NA | 0 0E+00 |
| Mercury | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Molybdenum | NA | - | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Nickel | NA | - | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Pyrene | NA | | — | NA | — | — | — | NA | NA | - | — | NA | — | — | — | NA | 0 0E+00 |
| Sil er | NA | | | NA | — | — | — | NA | NA | — | — | NA | — | - | — | NA | 0 0E+00 |
| Stront m | NA | — | - | NA | — | — | — | NA | NA | — | — | NA | — | - | - | NA | 0 0E+00 |
| T rachloroethe | NA | | - | NA | . | — | — | NA | NA | — | — | NA | — | | - | NA | 0 0E+00 |
| Trichloroethene | NA | - | | NA | — | — | — | NA | NA | — | - | NA | — | - | | NA | 0 0E+00 |
| Vanadi m | NA | - | | NA | — | — | — | NA | NA | - | — | NA | — | — | — | NA | 0 0E+00 |
| Zinc | NA | | | NA | — | — | — | NA | NA | — | — | NA | — | | — | NA | 0 0E+00 |
| Americ m 241 | NA | — | — | NA | — | — | — | 4 1E-13 | NA | — | — | NA | — | — | | NA | 0 0E+00 |
| Pluton um-239/240 | NA | — | — | NA | — | — | — | 1 7E-12 | NA | — | — | NA | — | — | | NA | 4 1E-13 |
| Radium-226 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 1 7E-12 |
| Uranium-233/234 | 7 4E-10 | — | — | 1 1E-10 | — | — | — | 1.5E-09 | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Uranium 235 | 2.1E-10 | — | — | 8.5E-12 | — | — | — | 3.2E-10 | NA | — | — | NA | — | — | — | 4 6E-11 | 2 4E-09 |
| Uranium 238 | 7 9E-09 | — | — | 1 2E-10 | — | — | — | 1 7E-08 | NA | — | — | NA | — | — | — | 7 8E-08 | 7 9E-08 |
| | | | | | | | | | | | | | | | | 5 0E-07 | 5 2E-07 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 4 8E-08 | 0.0E+00 | 0 0E+00 | 1 0E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1 9E-08 | 2.2E-08 | 0 0E+00 | 0 0E+00 | 0.0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 5 8E-07 | |
| | | | | | | | | | | | | | | | | | |
| | T tal risk. | 6.8E-07 | | | | | | | | | | | | | | | |

— not pplicabl pathw y

NA ot a COC for thi medium r no toxicity factor is available

## Table 6-95
## Office Worker CT Carcinogenic Risk Factors for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediments | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Rad Exposure | Total Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | — | — | — | | | NA | NA | - | | NA | | | | NA | 0.0E+00 |
| Aluminum | NA | – | — | — | — | | | NA | NA | – | | NA | | | | NA | 0.0E+00 |
| Antimony | NA | – | — | — | – | | – | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Aroclor 1254 | 5.2E-09 | — | — | - | — | | | NA | 5.2E-08 | | | NA | | | | NA | 5.8E-08 |
| Barium | NA | — | — | — | — | | — | NA | NA | – | | NA | | | — | NA | 0.0E+00 |
| Benzo(a)anthracene | 1.7E-09 | — | | — | — | – | | NA | NA | | | NA | | | | NA | 1.7E-09 |
| Benzo(a)pyrene | 1.3E-08 | — | — | — | — | — | | NA | NA | - | | NA | | | | NA | 1.3E-08 |
| Benzo(b)fluoranthene | 1.8E-09 | — | — | — | — | | — | NA | NA | – | – | NA | | | | NA | 1.8E-09 |
| Beryllium | NA | — | — | — | — | — | – | NA | NA | | – | NA | | | | NA | 0.0E+00 |
| Cadmium | NA | — | — | — | — | – | — | NA | NA | — | | NA | | | | NA | 0.0E+00 |
| Copper | NA | — | — | — | — | — | — | NA | NA | — | – | NA | | | | NA | 0.0E+00 |
| Dibenzo(a,h)anthracene | 8.1E-09 | – | — | — | — | — | — | NA | NA | — | - | NA | - | — | - | NA | 8.1E-09 |
| 1,1 Dichloroethene | NA | — | — | — | — | — | — | NA | NA | – | — | NA | | | – | NA | 0.0E+00 |
| 1,2 Dichloroethene | NA | - | — | — | — | — | — | NA | NA | - | – | NA | | | | NA | 0.0E+00 |
| Fluoranthene | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | 2.2E-09 | — | — | — | — | — | - | NA | NA | | | NA | | | | NA | 2.2E-09 |
| Lithium | NA | — | — | — | — | — | — | NA | NA | — | — | NA | — | - | – | NA | 0.0E+00 |
| Manganese | NA | — | — | — | — | — | — | NA | NA | — | — | NA | | | | NA | 0.0E+00 |
| Mercury | NA | — | — | — | — | — | — | NA | NA | — | | NA | | | | NA | 0.0E+00 |
| Molybdenum | NA | - | — | - | — | – | — | NA | NA | | | NA | — | – | — | NA | [illegible] |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Pyrene | NA | | | | — | | — | NA | NA | | | NA | — | | | NA | 0.0E+00 |
| Silver | NA | | — | — | — | — | | NA | NA | | | NA | – | — | | NA | 0.0E+00 |
| Strontium | NA | | – | | – | | | NA | NA | - | — | NA | — | | - | NA | 0.0E+00 |
| Tetrachloroethene | NA | | | | — | — | – | NA | NA | | — | NA | - | | | NA | 0.0E+00 |
| Trichloroethene | NA | | | | — | — | | NA | NA | | — | NA | — | — | | NA | 0.0E+00 |
| Vanadium | NA | | | | — | — | – | NA | NA | | — | NA | — | — | — | NA | 0.0E+00 |
| Zinc | NA | | - | — | — | — | — | NA | NA | - | — | NA | — | — | — | NA | 0.0E+00 |
| Americium 241 | NA | | — | — | — | – | — | 1.7E-12 | NA | | — | NA | | - | — | NA | 1.7E-12 |
| Plutonium 239/240 | NA | | – | — | — | – | — | 6.8E-12 | NA | — | — | NA | — | – | - | NA | 6.8E-12 |
| Radium 226 | NA | — | — | — | — | — | — | NA | NA | — | — | NA | — | — | | NA | 0.0E+00 |
| Uranium 233/234 | 6.0E-10 | — | — | — | — | — | — | 6.0E-09 | NA | – | — | NA | — | — | - | 1.4E-10 | 6.7E-09 |
| Uranium 235 | 1.7E-10 | — | — | — | — | — | — | 1.3E-09 | NA | – | — | NA | — | – | — | 2.4E-07 | 2.4E-07 |
| Uranium 238 | 6.4E-09 | — | — | — | — | — | — | 7.1E-08 | NA | — | — | NA | — | - | — | 1.5E-06 | 1.6E-06 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 3.9E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 7.8E-08 | 5.2E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.7E-06 | |
| | | | | | | | | | | | | | | | | | |
| | Total risk: | 1.9E-06 | | | | | | | | | | | | | | | |

— = not an applicable pathway

NA not a COC for this medium or no toxicity factor is available

## Table 6-96
## Open Space User CT Carcinogenic Risk Factors for AOC1

| Chemicals of Concern | Ingestio f Surface Soil | Ingestio of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion f Surface W te | Ingestio f Seep Water | Inhalatio of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorptio of Seep Sediments | Dermal Absorptio f Stream Sediments | Dermal Absorptio of Surface W te | Dermal Absorptio of Seep W te | External Radiatio Exposure | T tal Risk b Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0.0E+00 |
| Aluminum | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0.0E+00 |
| Antimony | NA | — | — | NA | — | — | — | NA | NA | — | - | NA | — | | — | NA | 0.0E+00 |
| Aroclor-1254 | 2.3E-09 | — | — | NA | — | — | — | NA | 2.9E-09 | — | — | NA | — | — | — | NA | 5 2E-09 |
| Barium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | | — | NA | 0 0E+00 |
| Benzo(a)anthracene | 7 7E-10 | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 7 7E 10 |
| Benzo(a)pyrene | 5.8E-09 | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 5.8E-09 |
| Benzo(b)fluoranthene | 7.8E-10 | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 7 8E 10 |
| Beryllium | NA | — | — | 3.6E-09 | — | — | — | NA | NA | — | | NA | - | | | NA | 3 6E 09 |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Copper | NA | — | — | NA | — | — | — | NA | NA | - | — | NA | — | — | — | NA | 0 0E+00 |
| Dibenzo(a,h)anthracene | 3 6E-09 | — | — | NA | — | — | — | NA | NA | — | — | NA | - | — | — | NA | 3 6E-09 |
| 1,1 Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | | NA | — | | — | NA | 0 0E+00 |
| 1,2-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | | — | NA | 0 0E+00 |
| Fluoranthene | NA | — | — | NA | — | — | — | NA | NA | — | | NA | — | | — | NA | 0 0E+00 |
| Indeno(1,2,3-cd)pyrene | 9.8E-10 | — | — | NA | — | — | — | NA | NA | — | — | NA | | — | — | NA | 9.8E-10 |
| Lithium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | — | — | NA | 0 0E 00 |
| Manganese | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Mercury | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Molybdenum | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | - | | — | NA | 0 0E+00 |
| Nickel | NA | — | - | NA | — | — | — | NA | NA | — | — | NA | — | - | | NA | 0 0E+00 |
| Pyrene | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | - | NA | 0 0E+00 |
| Silver | NA | — | — | NA | — | — | — | NA | NA | — | - | NA | — | — | — | NA | 0 0E+00 |
| Strontium | NA | - | — | NA | — | — | — | NA | NA | — | — | NA | | — | — | NA | 0.0E+00 |
| Tetrachloroethene | NA | — | | NA | — | — | — | NA | NA | — | — | NA | — | — | - | NA | 0 0E+00 |
| Trichloroethene | NA | — | — | NA | — | — | — | NA | NA | - | — | NA | — | — | — | NA | 0 0E+00 |
| Vanadium | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Zinc | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Americium 241 | NA | — | — | NA | — | — | — | 4.8E-14 | NA | — | — | NA | — | — | — | NA | 4 8E-14 |
| Plutonium-239/240 | NA | — | — | NA | — | — | — | 1.9E-13 | NA | — | — | NA | — | — | — | NA | 1 9E-13 |
| Radium-226 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | — | — | NA | 0 0E+00 |
| Uranium 233/234 | 2.7E-10 | — | — | 3.9E-11 | — | — | — | 1 7E-10 | NA | — | — | NA | — | — | — | 2.9E-11 | 5 0E-10 |
| Uranium-235 | 7.6E-11 | — | — | 3.1E-12 | — | — | — | 3.7E-11 | NA | — | — | NA | — | — | | 4 7E-08 | 4 7E-08 |
| Uranium-238 | 2.8E-09 | — | — | 4.2E-11 | — | — | — | 2.0E-09 | NA | — | — | NA | — | — | — | 3 0E-07 | 3 0E-07 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 1 7E-08 | 0 0E+00 | 0.0E+00 | 3.7E-09 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 2.2E-09 | 2.9E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0.0E+00 | 0.0E+00 | 3 5E-07 | |
| | | | | | | | | | | | | | | | | | |
| | Total Risk | 3 7E-07 | | | | | | | | | | | | | | | |

— = not applicabl pathway
NA = not a COC for this medium r no toxicity factor is availabl

## Table 6-97
## Construction Worker RME Carcinogenic Risk Factors for AOC2

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Rad Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA | 0.0E+00 |
| Aluminum | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Antimony | NA | NA | — | — | — | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Aroclor 1254 | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | — | NA | 0.0E+00 |
| Barium | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | | | | NA | 0.0E+00 |
| Benzo(a)anthracene | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | — | | — | NA | 0.0E+00 |
| Benzo(a)pyrene | 2.2E-08 | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA | 2.2E-08 |
| Benzo(b)fluoranthene | 4.3E-11 | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA | 4.3E-11 |
| Beryllium | NA | 2.3E-08 | — | — | — | — | — | NA | NA | NA | | NA | | | | NA | 2.3E-08 |
| Cadmium | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | | — | — | NA | 0.0E+00 |
| Copper | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA | 0.0E+00 |
| Dibenzo(a,h)anthracene | 7.5E-10 | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | — | NA | 7.5E-10 |
| 1,1-Dichloroethene | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA | 0.0E+00 |
| 1,2-Dichloroethene | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA | 0.0E+00 |
| Fluoranthene | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | 1.1E-10 | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA | 1.1E-10 |
| Lithium | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | — | NA | 0.0E+00 |
| Manganese | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | | — | NA | 0.0E+00 |
| Mercury | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | | | | NA | 0.0E+00 |
| Molybdenum | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | | — | | NA | 0.0E+00 |
| Nickel | NA | NA | | — | — | — | — | NA | NA | NA | — | NA | | | | NA | 0.0E+00 |
| Pyrene | NA | NA | | — | — | — | — | NA | NA | NA | — | NA | — | | | NA | 0.0E+00 |
| Sulfur | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | NA | — | | — | — | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Tetrachloroethene | NA | NA | | — | — | — | — | NA | NA | NA | | NA | — | | | NA | 0.0E+00 |
| Trichloroethene | NA | NA | — | | | — | — | NA | NA | NA | | NA | — | | — | NA | 0.0E+00 |
| Vanadium | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | | — | — | NA | 0.0E+00 |
| Zinc | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | — | — | — | NA | 0.0E+00 |
| Americium 241 | NA | NA | — | — | — | — | — | 1.4E-12 | NA | NA | — | NA | | — | | NA | 1.4E-12 |
| Plutonium 239/240 | NA | NA | — | — | — | — | — | 5.4E-12 | NA | NA | — | NA | — | — | — | NA | 5.4E-12 |
| Radium 226 | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | — | — | | NA | 0.0E+00 |
| Uranium-233/234 | 1.2E-09 | 7.7E-10 | — | — | — | — | — | 4.7E-10 | NA | NA | — | NA | — | — | — | 6.5E-12 | 2.4E-09 |
| Uranium-235 | 8.1E-11 | 1.4E-10 | — | — | — | — | — | 5.6E-11 | NA | NA | — | NA | — | — | | 2.5E-09 | 2.8E-09 |
| Uranium 238 | 3.9E-09 | 2.6E-09 | — | — | — | — | — | 2.5E-09 | NA | NA | — | NA | — | — | | 2.1E-08 | 3.0E-08 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 2.8E-08 | 2.6E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.0E-09 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 2.3E-08 | |
| | Total risk | 8.1E-08 | | | | | | | | | | | | | | | |

— Not an applicable pathway

NA not a COC for this medium or no toxicity factor is available.

## Table 6-98
## Current Worker RME Carcinogenic Risk Factors for AOC2

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | - | — | — | — | - | — | NA | NA | — | | - | — | | | NA | 0 0E+00 |
| Aluminum | NA | | — | — | — | | — | NA | NA | | | | | | | NA | 0 0E+00 |
| Antimony | NA | | — | — | - | | — | NA | NA | | | | | | | NA | 0 0E+00 |
| Aroclor-1254 | NA | — | — | — | — | | | NA | NA | | | — | - | | | NA | 0 0E+00 |
| Barium | NA | — | — | — | — | | | NA | NA | - | — | - | | | | NA | 0 0E+00 |
| Benzo(a)anthracene | NA | | | — | — | | | NA | NA | | | | | | | NA | [illegible]0E+00 |
| Benzo(a)pyrene | 4 8E-07 | | - | — | | | | NA | NA | | | | | | | NA | 4 [illegible]E-07 |
| Benzo(b)fluoranthene | 9 4E-10 | | | - | | | | NA | NA | | — | - | | | | NA | 9 4E-1[illegible] |
| Beryllium | NA | | - | - | | — | | NA | NA | | - | | | | | NA | 0 0E+00 |
| Cadmium | NA | - | — | — | — | - | — | NA | NA | | - | | | | | NA | 0 0E 00 |
| Copper | NA | - | — | — | — | — | - | NA | NA | | | - | | - | | NA | 0 0E+00 |
| Dibenzo(a,h)anthracene | 1 6E-08 | — | — | — | — | | - | NA | NA | | | | | | | NA | 1 6E-08 |
| 1,1 Dichloroethene | NA | | | — | — | | - | NA | NA | | | - | | | | NA | 0 0E 00 |
| 1,2 Dichloroethene | NA | - | | - | — | — | — | NA | NA | | | | | | | NA | 0 0E+00 |
| Fluoranthene | NA | | - | — | — | — | — | NA | NA | | | | | | | NA | 0 0E+00 |
| Indeno(1,2,3-cd)pyrene | 2.4E-09 | — | | - | — | — | — | NA | NA | | | - | | | | NA | 2 4E-09 |
| Lithium | NA | | | — | — | | — | NA | NA | | | - | | | | NA | 0 0E+00 |
| Manganese | NA | | — | — | — | — | — | NA | NA | | | | | | | NA | 0 0E+00 |
| Mercury | NA | | | — | — | - | — | NA | NA | | | - | | | | NA | 0 0E+00 |
| Molybde[illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E[illegible] |
| Nickel | NA | | | | — | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Pyre[illegible] | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| [illegible] | NA | | | | | — | | NA | NA | | | | | | | NA | [illegible] |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| T[illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+[illegible] |
| Tr[illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+[illegible] |
| V[illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Z[illegible] | NA | | | | — | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Americium 241 | NA | | | | — | | | 1 7E-10 | NA | | | | — | | | NA | 1 7E 10 |
| Plutonium 239/240 | NA | | | - | — | — | — | 6.6E-10 | NA | | — | — | | | | NA | 6 6E 10 |
| Radium 226 | NA | - | — | | — | — | | NA | NA | - | | - | | | - | NA | 0 0E 00 |
| Uranium 233/234 | 2 6E-08 | | | | — | — | — | 5.8E-08 | NA | - | - | - | — | | | 9 2E 10 | 8 4E-08 |
| Uranium 235 | 1 8E-09 | | | - | - | - | | 7.3E-09 | NA | - | - | — | — | | | 3 5E-07 | 3 6E-07 |
| Uranium 238 | 8 6E-08 | - | — | - | — | — | | 3 0E-07 | NA | | | | | | | 2 9E-06 | 3 3E-06 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 6 1E-07 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 3 7E-07 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 3 3E-06 | |
| | Total Risk | 4 3E-06 | | | | | | | | | | | | | | | |

— – not an applicable pathway
NA – not COC for this medium [illegible]

## Table 6-99
## Ecological Worker RME Carcinogenic Risk Factors for AOC2

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sed | Dermal Absorption of Seep Sed | Dermal Absorption of Stream Sed | Dermal Absorption of Surface W | Dermal Absorption of Seep W | External Rad Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | | NA | - | - | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Aluminum | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Antimony | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Aroclor 1254 | NA | | | NA | — | | | NA | NA | | | NA | | | | NA | [illegible] |
| Barium | NA | - | | NA | - | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)pyrene | 2.6E-08 | - | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | 5.2E-11 | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Beryllium | NA | | | 3.1E-08 | - | | - | NA | NA | | — | NA | | | | NA | 3.1E-08 |
| Cadmium | NA | | | NA | — | — | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Copper | NA | | — | NA | — | — | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Dibenzo(a,h)anthracene | 8.9E-10 | - | | NA | — | — | | NA | NA | | | NA | | | | NA | 8.9E-10 |
| 1,1-Dichloroethene | NA | - | - | NA | — | — | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| 1,2-Dichloroethene | NA | — | | NA | | - | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Fluoranthene | NA | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | 1.3E-10 | - | | NA | — | — | | NA | NA | | | NA | | | | NA | 1.3E-10 |
| Lithium | NA | | | NA | | | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Manganese | NA | - | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Mercury | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Nickel | NA | | | NA | | - | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Pyrene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| V[illegible] | NA | | | NA | | | | NA | NA | | - | NA | | | | NA | 0.0E+00 |
| Z[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Americium-241 | NA | | | NA | — | | - | 7.3E-12 | NA | | | NA | - | | | NA | 7.3E-12 |
| Plutonium-239/240 | NA | — | — | NA | — | — | - | 2.9E-11 | NA | | | NA | - | | | NA | 2.9E-11 |
| Radium-226 | NA | — | | NA | - | — | - | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Uranium-233/234 | 1.4E-09 | | — | 5.5E-10 | — | - | | 2.5E-09 | NA | - | — | NA | | | | 3.3E-11 | 4.5E-09 |
| Uranium-235 | 9.6E-11 | | | 3.6E-11 | | | | 3.2E-10 | NA | | | NA | | | | 1.3E-08 | [illegible] |
| Uranium-238 | 4.7E-09 | | | 1.3E-09 | — | | | 1.3E-08 | NA | | | NA | | | | 1.0E-07 | 1.2E-07 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 3.4E-08 | 0.0E+00 | 0.0E+00 | 3.3E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.6E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.2E-07 | |
| | Total risk. | 2.0E-07 | | | | | | | | | | | | | | | |

— not an applicable pathway

NA not a COC for this medium or no toxicity factor is available

**Table 6-100**
**Office Worker RME Carcinogenic Risk Factors for AOC2**

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | — | — | — | — | NA | NA | — | | NA | — | | | NA |
| Aluminum | NA | — | | | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | — | — | | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | — | | — | — | — | | NA | NA | | | NA | | | | NA |
| Barium | NA | — | | — | — | — | | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | — | — | — | — | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 4.8E-07 | — | — | | | | | NA | NA | | | NA | | | — | NA |
| Benzo(b)fluoranthene | 9.4E-10 | — | | | | | | NA | NA | | | NA | | | | NA |
| Beryllium | NA | | — | — | | | | NA | NA | | | NA | | | | NA |
| Cadmium | NA | | — | — | | | | NA | NA | | | NA | | | | NA |
| Copper | NA | — | — | — | | | | NA | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 1.6E-08 | — | | — | — | | | NA | NA | | | NA | | | | NA |
| 1,1 Dichloroethene | NA | | — | — | — | — | — | NA | NA | | | NA | | | | NA |
| 1,2 Dichloroethene | NA | — | | — | | — | | NA | NA | | | NA | | | | NA |
| Fluoranthene | NA | — | | — | | | — | NA | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 2.4E-09 | — | — | — | — | — | — | NA | NA | | | NA | | | | NA |
| Lithium | NA | | | — | — | — | | NA | NA | | — | NA | | | | NA |
| Manganese | NA | | | | | | — | NA | NA | | | NA | | | | NA |
| Mercury | NA | | | — | | | | NA | NA | | | NA | | | | NA |
| Molybdenum | NA | | | — | | | | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Pyrene | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | — | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA |
| Americium 241 | NA | | | | | — | | 1.7E-10 | NA | | | NA | | | | NA |
| Plutonium 239/240 | NA | | | — | — | | | 6.6E-10 | NA | | | NA | | | | NA |
| Radium 226 | NA | — | | — | — | — | — | NA | NA | | — | NA | — | | | NA |
| Uranium 233/234 | 2.6E-08 | | — | — | — | | — | 5.8E-08 | NA | | — | NA | | | | 9.2E-10 |
| Uranium 235 | 1.8E-09 | | — | — | — | — | — | 7.3E-09 | NA | — | — | NA | | | | 3.5E-07 |
| Uranium 238 | 8.6E-08 | — | | — | — | — | — | 3.0E-07 | NA | | — | NA | | | | 2.9E-06 |
| Risks by pathway | 6.1E-07 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.7E-07 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.3E-06 |
| Total Risk | 4.3E-06 | | | | | | | | | | | | | | | |

— = not applicable pathway
NA = not COC for this medium or no toxicity factor available

## Table 6-101

### Open Space User RME Carcinogenic Risk Factors for AOC2

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sed | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sed | Dermal Absorption of Surface W | Dermal Absorption of Seep W | External Radiation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Aluminum | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Antimony | NA | | — | NA | | | | NA | NA | | | NA | | | | NA |
| Aroclor 1254 | NA | — | - | NA | | | - | NA | NA | | | NA | | | | NA |
| Barium | NA | — | — | NA | | | — | NA | NA | | | NA | | | | NA |
| Benzo(a)anthracene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(a)pyrene | 4.6E-08 | - | | NA | | | | NA | NA | | | NA | | | | NA |
| Benzo(b)fluoranthene | 9.0E-11 | — | — | NA | | - | - | NA | NA | | | NA | | | | NA |
| Beryllium | NA | - | — | 5.4E-08 | | | — | NA | NA | | | NA | | | | NA |
| Cadmium | NA | — | | NA | | — | | NA | NA | | | NA | | | | NA |
| Copper | NA | — | — | NA | — | — | | NA | NA | | | NA | | | | NA |
| Dibenzo(a,h)anthracene | 1.6E-09 | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA |
| 1,1-Dichloroethene | NA | — | — | NA | - | | | NA | NA | | | NA | | | | NA |
| 1,2-Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Fluoranthene | NA | | | NA | - | | | NA | NA | | | NA | | | | NA |
| Indeno(1,2,3-cd)pyrene | 2.3E-10 | | | NA | | | | NA | NA | | | NA | | | | NA |
| Lithium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Manganese | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Mercury | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Molybdenum | NA | | | NA | | | — | NA | NA | | | NA | | | | NA |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Py[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Si[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| S[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T hl [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| T hl [illegible] h | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Vanadium | NA | | | NA | | | | NA | NA | | | NA | | | | NA |
| Z[illegible] | NA | | | NA | | | | NA | NA | — | | NA | | | | NA |
| Americium 241 | NA | | - | NA | | | - | 2.1E-11 | NA | - | - | NA | | | | NA |
| Plutonium 239/240 | NA | — | | NA | | | — | 8.4E-11 | NA | — | | NA | | | | NA |
| Radium 226 | NA | — | | NA | — | | — | NA | NA | - | — | NA | | | | NA |
| Uranium 233/234 | 2.5E-09 | — | | 9.6E-10 | — | — | — | 7.3E-09 | NA | — | — | NA | — | | | 1.3E-10 |
| Uranium 235 | 1.7E-10 | — | — | 6.2E-11 | — | — | - | 9.2E-10 | NA | | — | NA | — | — | | 5.0E-08 |
| Uranium 238 | 8.2E-09 | | | 2.2E-09 | - | — | — | 3.8E-08 | NA | - | - | NA | | | | 4.2E-07 |
| | Risks by pathway | | | | | | | | | | | | | | | |
| | 5.8E-08 | 0.0E+00 | 0.0E+00 | 5.7E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4.7E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4.7E-07 |
| | Total risk | 6.3E-07 | | | | | | | | | | | | | | |

— not an applicable pathway
NA not COC for this medium or no toxicity factor is available

# Table 6 102
## Construction Worker CT Carcinogenic Risk Factors for AOC2

| Chem ls f C r | Ing tio f S rface S l | Inge ti f Subs rface S il | Ingesti f Pond Sedim | Inge tio f Se p Sedime | Inge ti f S re m Se l m | Ingestio f S rface W t | I ge f Seep W | Inhala io of A rbo n I rti l s | Dermal Absorptio f S rface S l | Dermal Abso p io f Subs rface S l | Dermal Absorptio f P nd Sed | Dermal Absorptio f Seep Se l | Dermal Abso ptio f Stre m Se l | Dermal Absorptio f Surface W | De al Abso ptio f Se p W | E rnal Rad ti Exposu | I l Risk b I m l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | | — | - | | | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Aluminum | NA | NA | | - | - | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Antimony | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Aroclor 1254 | NA | NA | — | — | - | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Barium | NA | NA | | — | — | - | | NA | NA | NA | | NA | | | | NA | 0E+00 |
| Benzo( )anthracene | NA | NA | - | — | | | — | NA | NA | NA | | NA | | | | NA | 0E+00 |
| Benzo(a)pyrene | 3.9E-09 | NA | — | | - | | — | NA | NA | NA | | NA | | | | NA | 3 9E-09 |
| Benzo(b)fluor nthene | 7 7E-12 | NA | | — | - | - | - | NA | NA | NA | | NA | | | | NA | 7 7E 12 |
| Berylli m | NA | 4 0E-09 | - | — | - | | | NA | NA | NA | | NA | | | | NA | 4 0E 09 |
| Cadmium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0E 00 |
| Coppe | NA | NA | — | — | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Dibenzo( h)anthracene | 1.3E-10 | NA | - | — | | | | NA | NA | NA | | NA | | | | NA | 1 3E-10 |
| 1,1 Dichloroethene | NA | NA | — | - | — | — | - | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| 1,2 Dichloroethene | NA | NA | | - | — | — | - | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Fluora thene | NA | NA | | - | — | — | | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Indeno(1 2,3-cd)pyrene | 1 9E-11 | NA | - | - | - | — | | NA | NA | NA | | NA | | | | NA | 1 9E 11 |
| Lithium | NA | NA | | | — | — | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Manganese | NA | NA | - | - | | | - | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Merc ry | NA | NA | | | | - | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Molybde | NA | NA | | | - | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| N k l | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Pyre | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 E 00 |
| Sil | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| St u | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| T a hlene h | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| T he | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| V u | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Z | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0E 00 |
| Am 241 | NA | NA | | | - | | | 1 1E-12 | NA | NA | | NA | | | | NA | 1 1E 12 |
| Pl to um 239/240 | NA | NA | - | - | — | | — | 4 3E-12 | NA | NA | | NA | - | | - | NA | 4 3E 12 |
| Radi m-226 | NA | NA | — | - | — | - | — | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Uran um 233/234 | 2 1E-10 | 1 4E-10 | | - | — | — | — | 3 7E-10 | NA | NA | - | NA | | | | 5 2E 12 | 7 3E 10 |
| Uranium 235 | 1 4E-11 | 2.4E-11 | - | | — | | — | 4.8E-11 | NA | NA | | NA | | | | 2 0E-09 | 2 1E 09 |
| Uranium 238 | 7 0E-10 | 4 7E-10 | | — | - | | — | 2.0E-09 | NA | NA | | NA | | | | 1 7E-08 | 2 0E 08 |
| | Risks by pathw y | | | | | | | | | | | | | | | | |
| | 5 0E-09 | 4 6E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 2 4E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E 00 | 0 0E 00 | 1 9E 08 | |
| | T tal k | 3 1E-08 | | | | | | | | | | | | | | | |

— not a pplicable pathw y

NA not COC fo thi med m no tox y facto va lable

# Table 6 103
## Current Worker CT Carcinogenic Risk Factors for AOC2

| Chemical | Ing of Surface Soil | Ing of Subsurface Soil | Ing of Pond Sed | Ing of Seep Sed | Ing of Stream Sed | Ing of Surface W | Ing of Seep W | Inhalation of Airborne | Dermal Absorpt of Surface Soil | Dermal Absorp of Subsurf Soil | Dermal Absorp of Pond Sed | Dermal Absorp of Seep Sed | Dermal Absorp of Stream Sed | Dermal Absorp of Surface W | Dermal Absorp of Seep W | External Rad Exposure | Total Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Aluminum | NA | | - | -- | | | | NA | NA | | | | | | | NA | [illegible] |
| Antimony | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Aroclor 1254 | NA | | -- | | -- | | | NA | NA | | | | | | | NA | [illegible] |
| Barium | NA | - | -- | -- | - | | - | NA | NA | | | - | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | | -- | - | -- | | -- | NA | NA | - | | | | | | NA | [illegible] |
| Benzo(a)pyrene | 1.2E-08 | | -- | -- | -- | - | -- | NA | NA | | | | | | | NA | 1.2E-08 |
| Benzo(b)fluoranthene | 2.4E-11 | | -- | | -- | -- | -- | NA | NA | | | | | | | NA | 2.4E-11 |
| Beryllium | NA | | -- | -- | -- | -- | | NA | NA | | | | | | | NA | [illegible] |
| Cadmium | NA | -- | | -- | -- | -- | -- | NA | NA | -- | | | | | | NA | [illegible] |
| Copper | NA | -- | -- | -- | -- | -- | - | NA | NA | -- | | | | | | NA | [illegible] |
| Dibenzo(a,h)anthracene | 4.1E-10 | -- | -- | -- | -- | -- | -- | NA | NA | - | | -- | | | | NA | 4.1E-10 |
| 1,1-Dichloroethene | NA | -- | -- | -- | -- | -- | -- | NA | NA | -- | | -- | | | | NA | 0.0E+00 |
| 1,2-Dichloroethene | NA | | -- | -- | -- | -- | - | NA | NA | -- | | | | | | NA | 0.0E+00 |
| Fluoranthene | NA | -- | -- | | -- | -- | -- | NA | NA | | | | | | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | 5.9E-11 | -- | | - | -- | -- | -- | NA | NA | -- | | | | | | NA | 5.9E-11 |
| Lithium | NA | -- | -- | - | - | -- | - | NA | NA | -- | | | | | | NA | 0.0E+00 |
| Manganese | NA | | | | | -- | - | NA | NA | | | | | | | NA | [illegible] |
| Mercury | NA | | - | | -- | -- | | NA | NA | | | | | | | NA | 0.0E+00 |
| Molybdenum | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Nickel | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Pyrene | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | - | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | | - | | | NA | 0.0E |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | - | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Z[illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Americium-241 | NA | | | | | | -- | 2.1E-11 | NA | | | | | | | NA | 2.1E-11 |
| Plutonium-239/240 | NA | -- | - | - | -- | | | 8.3E-11 | NA | | | | | | | NA | [illegible] |
| Radium 226 | NA | -- | -- | | | | - | NA | NA | | | -- | | | | NA | [illegible] |
| Uranium-233/234 | 6.5E-10 | -- | -- | | -- | -- | -- | 7.3E-09 | NA | -- | | -- | -- | | - | 7.8E-11 | 8.0E-09 |
| Uranium 235 | 4.4E-11 | -- | -- | | -- | -- | | 9.2E-10 | NA | -- | | -- | | | | 3.0E-08 | 3.1E-08 |
| Uranium 238 | 2.2E-09 | -- | -- | -- | -- | -- | -- | 3.8E-08 | NA | -- | -- | -- | | | | 2.5E-07 | 2.9E-07 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 1.5E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4.7E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E 00 | 0.0E+00 | 2.8E-07 | |
| | Total risk | 3.4E-07 | | | | | | | | | | | | | | | |

-- not an applicable pathway

NA not COC for this medium or no toxicity factors available.

## Table 6-104
### Ecological Worker CT Carcinogenic Risk Factors for AOC2

| Chem l fC nce | Ingestio f Surface So l | Ingestio of Subs rface So l | I ge tio f Pond Sedime ts | Ingestio of Seep Sedim | Ingestio f Stre m Sedimen | Inge tio f Surface W te | I ge t f Seep W te | I hal tio f Airborne Partic l te | Dermal Absorptio of Surface So l | Dermal Absorptio f Subsurface So l | Dermal Absorptio f Pond Sedim t | Dermal Absorptio f Seep Sediments | Dermal Absorptio of Stream Sed m ts | De mal Abso ptio f Surface W | D al Absorp io f Se p W t | Ex al R d tio Exposure | T l Risk ly hei l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | -- | -- | NA | | | -- | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Aluminum | NA | - | -- | NA | - | | | NA | NA | | | NA | | | | NA | 0 0F 00 |
| Ant mony | NA | | - | NA | | | | NA | NA | | | NA | -- | | | NA | 0 0E 00 |
| Aroclo 1254 | NA | -- | -- | NA | - | | | NA | NA | | | NA | | | | NA | 0E 00 |
| Barium | NA | | -- | NA | -- | | -- | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Benzo( )anthrace | NA | | -- | NA | -- | | - | NA | NA | | | NA | -- | | | NA | 7 4E 0 |
| Benzo( )pyrene | 7 4E-09 | | -- | NA | -- | - | - | NA | NA | | | NA | | | | NA | 1 4E 11 |
| Benzo(b)fluor n hene | 1 4E 11 | | | NA | | | | NA | NA | | | NA | | | | NA | 8 7E 09 |
| Beryllium | NA | | | 8 7E-08 | - | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Cadmium | NA | -- | -- | NA | -- | - | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Copper | NA | - | | NA | -- | | | NA | NA | | | NA | | | | NA | 2.5E 10 |
| Dibenzo( h)anthracene | 2 5E-10 | - | -- | NA | - | | | NA | NA | - | | NA | | | | NA | 0 0E+00 |
| 1 1 Dichloroethene | NA | -- | - | NA | -- | -- | -- | NA | NA | | | NA | | | | NA | 0 0E+00 |
| 1 2 Dichloroethene | NA | | | NA | -- | | | NA | NA | | | NA | | | | NA | 0E+00 |
| Fluora thene | NA | | -- | NA | -- | | | NA | NA | | | NA | | | | NA | 3 6E 11 |
| Indeno(1,2,3-cd)pyrene | 3 6E-11 | -- | | NA | -- | -- | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| thi m | NA | | | NA | -- | | | NA | NA | | | NA | | | | NA | ) 0E+00 |
| ng nese | NA | | | NA | -- | | | NA | NA | | | NA | | | | NA | 0F |
| rc ry | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 00 |
| lybde | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0F ) |
| k l | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E+ 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0F 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 F 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 E 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 F 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 F ( |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 ( F 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 9E 12 |
| A 241 | NA | | | NA | | | | 3 9E-12 | NA | | | NA | | | | NA | 1 5E 11 |
| Pl o m 239/240 | NA | | | NA | -- | | - | 1 5E-11 | NA | | | NA | | | | NA | 0 0E 00 |
| Radi m 226 | NA | | | NA | -- | | - | NA | NA | | | NA | | | | NA | 1 9E-09 |
| Uran m 233/234 | 4 0E-10 | -- | -- | 1.5E-10 | -- | | - | 1 3E-09 | NA | | | NA | | | | 2 6E-11 | 1 0F 08 |
| Urani m 235 | 2.7E-11 | - | | 1 0E-11 | -- | -- | - | 1 7E-10 | NA | | | NA | | | | 1 0E-08 | 9 2F 08 |
| Urani m 238 | 1 3E-09 | - | | 3 6E-10 | -- | | | 7 1E-09 | NA | | | | | | | 8 4E-08 | |
| | | | | | | | | Ri ks by pathw y | | | | | | | | | |
| | 9 4E-09 | 0 0E+00 | 0 0E+00 | 9 2E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 8 6E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 9 4E-08 | |
| | T tal k | 1 2E-07 | | | | | | | | | | | | | | | |

ot an pplicable pathw y

NA not COC fo thi med m no toxic ty facto ail bl

## Table 6-105
## Office Worker CT Carcinogenic Risk Factors for AOC2

| Chemical of Concern | Ing of Surface Soil | Ing of Subsurface Soil | Ing of Pond Sediment | Ing of Seep Sediment | Ing of Stream Sediment | Ing of Surface Water | Ing of Seep W | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sed | Dermal Absorption of Stream Sed | Dermal Absorption of SW | Dermal Absorption of Seep W | External Rad Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Aluminum | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Antimony | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Aroclor 1254 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Barium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Benzo(a)anthracene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Benzo(a)pyrene | 6.0E-09 | | | | | | | NA | NA | | | NA | | | | NA | 6.0E-09 |
| Benzo(b)fluoranthene | 1.2E-11 | | | | | | | NA | NA | | | NA | | | | NA | 1.2E-11 |
| Beryllium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Cadmium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Copper | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Dibenzo(a,h)anthracene | 2.0E-10 | | | | | | | NA | NA | | | NA | | | | NA | 2.0E-10 |
| 1,1-Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| 1,2-Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Fluoranthene | NA | | | | | | | NA | NA | | | NA | | | | NA | 3.0E-11 |
| Indeno(1,2,3-cd)pyrene | 3.0E-11 | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Lithium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Manganese | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Mercury | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Molybdenum | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Pyrene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Americium 241 | NA | | | | | | | 1.6E-11 | NA | | | NA | | | | NA | 1.6E-11 |
| Plutonium 239/240 | NA | | | | -- | | -- | 6.3E-11 | NA | - | - | NA | | | | NA | 6.3E-11 |
| Radium 226 | NA | | | - | -- | -- | | NA | NA | | | NA | - | | | NA | 0.0E+00 |
| Uranium 233/234 | 3.3E-10 | - | -- | -- | -- | -- | -- | 5.5E-09 | NA | - | -- | NA | - | | | 7.8E-11 | 5.9E-09 |
| Uranium 235 | 2.2E-11 | -- | -- | -- | -- | -- | -- | 7.0E-10 | NA | - | - | NA | - | | | 3.0E-08 | 3.1E-08 |
| Uranium 238 | 1.1E-09 | -- | -- | -- | -- | -- | -- | 2.9E-08 | NA | -- | -- | NA | - | | | 2.5E-07 | 2.8E-07 |
| | | | | | | | | Risks by pathway | | | | | | | | | |
| | 7.7E-09 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.5E-08 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 2.8E-07 | |
| | Total risk | 3.2E-07 | | | | | | | | | | | | | | | |

-- not applicable pathway

NA not COC for this medium or no toxicity factors available.

**Table 6-106**

**Open Space User CT Carcinogenic Risk Factors for AOC2**

| Chemical f Conc | Inge tio f S rface So l | Ingestio f Subsurface So l | Ingestio f Pond Sediment | Inge tio f Seep Sediments | Ingestio f Stream Sediments | Ingestio f Surface W te | Inge tio f Seep Wate | Inhalatio of Airborne P rticulate | Dermal Absorption f Surface Soil | Dermal Absorptio f Subsurface Soil | Dermal Absorptio f Pond Sed m ts | Dermal Absorptio f Seep Sedim t | Dermal Absorptio of Stream Sedimer | Dermal Absorptio f Surface W | Dermal Absorptio f Se p W | External Radi tio Exposure | T l Risk by Ch m l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | -- | -- | NA | | | - | NA | NA | | | NA | - | | | NA | 0 0E+00 |
| Aluminum | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0E+00 |
| Antimony | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Aroclor 1254 | NA | -- | -- | NA | - | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Barium | NA | | | NA | | -- | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Benzo(a)anthracene | NA | | | NA | -- | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Benzo(a)pyrene | 2 7E-09 | | | NA | -- | | | NA | NA | | | NA | | | | NA | 2 7E 09 |
| Benzo(b)fluoranthene | 5 3E-12 | | -- | NA | - | -- | | NA | NA | | | NA | | | | NA | 5 3E 12 |
| Beryllium | NA | -- | -- | 3 2E-09 | -- | -- | | NA | NA | -- | | NA | | | | NA | 3 2E 09 |
| Cadm um | NA | - | -- | NA | -- | -- | -- | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Coppe | NA | | -- | NA | - | -- | - | NA | NA | - | | NA | | | | NA | 0 0E+00 |
| Dibenzo(a h)anthracene | 9 1E-11 | -- | -- | NA | -- | -- | - | NA | NA | | | NA | | | | NA | 1E 11 |
| 1 1 Dichloroethene | NA | | -- | NA | -- | -- | -- | NA | NA | -- | - | NA | | | | NA | 0 0E 00 |
| 1 2 Dichloroethene | NA | -- | -- | NA | -- | -- | -- | NA | NA | | | NA | - | | | NA | 0 0E+00 |
| Fluoranthene | NA | -- | | NA | -- | -- | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Indeno(1,2,3-cd)pyrene | 1 3E-11 | | | NA | -- | -- | -- | NA | NA | | | NA | | | | NA | 1 3E 11 |
| L thi m | NA | -- | -- | NA | -- | -- | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Manganese | NA | | | NA | -- | -- | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| M rcury | NA | | -- | NA | | | | NA | NA | | | NA | | | | NA | 0 0E ( |
| M lybden | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| N k l | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| l y | N | | | NA | | | | NA | NA | | | NA | | | | NA | 0E 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| | NA | | | NA | | | | NA | NA | | | NA | -- | | | NA | 0 0E+00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0E 00 |
| / | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Am n 241 | NA | | | NA | - | | | 4 5E 13 | NA | | | NA | - | | | NA | 4 5E 13 |
| Pluto um 239/240 | NA | | -- | NA | -- | -- | | 1 8E-12 | NA | - | - | NA | -- | | | NA | 1 8E 12 |
| Radium 226 | NA | | | NA | -- | - | -- | NA | NA | -- | | NA | | | | NA | 0 0E 00 |
| Uranium 233/234 | 1 5E-10 | | | 5 6E-11 | -- | | | 1 6E-10 | NA | | -- | NA | | | | 1 6E-11 | 3 7E 10 |
| Uranium 235 | 9 8E 12 | | | 3 6E 12 | -- | | | 2 0E-11 | NA | | | NA | | | | 6 0E-09 | 6 1E 09 |
| Urani m 238 | 4 8E-10 | -- | | 1 3E-10 | -- | - | | 8 2E-10 | NA | -- | -- | NA | | | | 5 0E-08 | 5 2E 08 |
| | Risks by pathw y | | | | | | | | | | | | | | | | |
| | 3 4E-09 | 0 0E+00 | 0 0E+00 | 3.3E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 1 0E-09 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 5 6E-08 | |
| | Total k | 6 4E-08 | | | | | | | | | | | | | | | |

t pplicable pathw y

NA not COC fo hi med m no toxic y facto l bl

## Table 6 107
## Ecological Worker RME Carcinogenic Risk Factors for AOC3

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | — | | NA | — | NA | NA | — | — | | | NA | | NA | NA | | | [illegible] |
| Aluminum | | | NA | | NA | NA | | | — | | NA | | NA | NA | | | [illegible] |
| Antimony | — | — | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Aroclor 1254 | | | NA | — | NA | NA | | — | | | NA | | NA | NA | | | [illegible] |
| Barium | | — | NA | — | NA | NA | — | — | | — | NA | | NA | NA | | | [illegible] |
| Benzo(a)anthracene | | — | NA | — | NA | NA | | — | | | NA | | NA | NA | | | [illegible] |
| Benzo(a)pyrene | — | — | NA | — | NA | NA | — | — | — | | NA | | NA | NA | | | [illegible] |
| Benzo(b)fluoranthene | | — | NA | — | NA | NA | — | — | — | | NA | | NA | NA | | | [illegible] |
| Beryllium | — | | NA | — | NA | NA | | — | | — | NA | | NA | NA | | | 0.0E+00 |
| Cadmium | — | — | NA | — | NA | NA | — | — | — | | NA | — | NA | NA | | | 0.0E+00 |
| Copper | — | — | NA | — | NA | NA | — | — | — | | NA | — | NA | NA | | | 0.0E+00 |
| Dibenzo(a,h)anthracene | | — | NA | — | NA | NA | — | | — | — | NA | — | NA | NA | | | 0.0E+00 |
| 1,1 Dichloroethene | | — | NA | | NA | NA | — | — | | | NA | — | NA | NA | | | 0.0E+00 |
| 1,2 Dichloroethene | — | | NA | — | NA | NA | — | — | — | — | NA | | NA | NA | | | 0.0E+00 |
| Fluoranthene | — | — | NA | — | NA | NA | — | — | — | | NA | | NA | NA | | | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | — | — | NA | | NA | NA | — | — | — | — | NA | | NA | NA | | | 0.0E+00 |
| Lithium | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | | | 0.0E+00 |
| Manganese | — | — | NA | | NA | NA | — | — | — | — | NA | | NA | NA | | | 0.0E+00 |
| Mercury | — | — | NA | | NA | NA | — | | — | — | NA | | NA | NA | | | 0.0E+00 |
| Molybdenum | | | NA | | NA | NA | — | | | | NA | — | NA | NA | | | 0.0E+00 |
| Nickel | | | NA | | NA | NA | | | | — | NA | — | NA | NA | | | 0.0E+00 |
| Pyrene | | | NA | | NA | NA | | | — | | NA | | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | — | NA | — | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | — | | | NA | — | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | — | — | NA | | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Vanadium | | | NA | | NA | NA | | | | — | NA | — | NA | NA | | | 0.0E+00 |
| Zinc | | | NA | | NA | NA | | | — | | NA | | NA | NA | | | 0.0E+00 |
| Americium 241 | | | 1.9E-09 | | 1.2E-09 | 2.9E-11 | — | | — | — | NA | — | NA | NA | | | 3.1E-09 |
| Plutonium 239/240 | — | | 9.8E-09 | — | 6.3E-09 | NA | — | | — | — | NA | — | NA | NA | | | 1.6E-08 |
| Radium-226 | — | — | NA | | NA | NA | — | — | — | — | NA | | NA | NA | | | 0.0E+00 |
| Uranium 233/234 | — | — | 9.0E-10 | — | NA | 4.5E-11 | — | — | — | — | NA | — | NA | NA | | | 9.4E-10 |
| Uranium 235 | — | — | 5.8E-11 | — | NA | NA | — | | — | — | NA | — | NA | NA | | | 5.8E-11 |
| Uranium 238 | — | — | 1.0E-09 | — | NA | 6.3E-11 | — | — | — | — | NA | — | NA | NA | | — | 1.1E-09 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 0.0E+00 | 0.0E+00 | 1.4E-08 | 0.0E+00 | 7.5E-09 | 1.4E-10 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total risk: | 2.1E-08 | | | | | | | | | | | | | | | |

— not an applicable pathway

NA not a COC for this medium or no toxicity factor is available.

**Table 6-108**
**Open Space User RME Carcinogenic Risk Factors for AOC3**

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Aluminum | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Antimony | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Aroclor-1254 | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Barium | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Benzo(a)anthracene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Benzo(a)pyrene | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Benzo(b)fluoranthene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Beryllium | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Cadmium | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Copper | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Dibenzo(a,h)anthracene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| 1,1-Dichloroethene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| 1,2-Dichloroethene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Fluoranthene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Lithium | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Manganese | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Mercury | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Molybdenum | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Pyrene | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Tetrachloroethene | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Trichloroethene | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Vanadium | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Zinc | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Americium 241 | | | 3.2E-09 | | 2.1E-09 | 4.3E-10 | | | | | NA | | NA | NA | | | 5.8E-09 |
| Plutonium 239/240 | | | 1.7E-08 | | 1.1E-08 | NA | | | | | NA | | NA | NA | | | 2.8E-08 |
| Radium 226 | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Uranium 233/234 | | | 1.6E-09 | | NA | 6.7E-10 | | | | | NA | | NA | NA | | | [illegible] |
| Uranium 235 | | | 1.0E-10 | | NA | NA | | | | | NA | | NA | NA | | | 1.0E-10 |
| Uranium 238 | | | 1.7E-09 | | NA | 9.5E-10 | | | | | NA | | NA | NA | | | 2.7E-09 |
| Risk by pathway | 0.0E+00 | 0.0E+00 | 2.4E-08 | 0.0E+00 | 1.3E-08 | 2.1E-09 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| Total Risk | 3.9E-08 | | | | | | | | | | | | | | | | |

-- = not applicable pathway
NA = not COC for this medium or no toxicity factor available

## Table 6-109
## Ecological Worker CT Carcinogenic Risk Factors for AOC3

| Chemical | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | -- | | NA | -- | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Aluminum | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Antimony | | | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Aroclor 1254 | | | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Barium | | | NA | -- | NA | NA | | | - | | NA | | NA | NA | | | [illegible] |
| Benzo(a)anthracene | | | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Benzo(a)pyrene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Benzo(b)fluoranthene | | -- | NA | -- | NA | NA | | -- | | | NA | | NA | NA | | | [illegible] |
| Beryllium | | -- | NA | -- | NA | NA | -- | | | - | NA | | NA | NA | | | [illegible] |
| Cadmium | -- | -- | NA | -- | NA | NA | | -- | | | NA | | NA | NA | | | 0.0E+00 |
| Copper | -- | -- | NA | -- | NA | NA | -- | | | | NA | | NA | NA | | | 0.0E+00 |
| Dibenzo(a,h)anthracene | -- | -- | NA | -- | NA | NA | -- | -- | - | | NA | | NA | NA | | | 0.0E+00 |
| 1,1-Dichloroethene | -- | -- | NA | -- | NA | NA | | -- | | | NA | | NA | NA | | | 0.0E+00 |
| 1,2-Dichloroethane | - | -- | NA | | NA | NA | - | | | | NA | | NA | NA | | | 0.0E+00 |
| Fluoranthene | | | NA | - | NA | NA | | | - | | NA | | NA | NA | | | [illegible] |
| Indeno(1,2,3-cd)pyrene | | | NA | -- | NA | NA | | - | | | NA | | NA | NA | | | 0.0E+00 |
| Lithium | | -- | NA | -- | NA | NA | | | - | | NA | | NA | NA | | | 0.0E+00 |
| Manganese | -- | -- | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| Mercury | | -- | NA | -- | NA | NA | - | | - | | NA | | NA | NA | | | 0.0E+00 |
| Molybdenum | | | NA | | NA | NA | - | | | | NA | | NA | NA | | | 0.0E+00 |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | - | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible] |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0.0E+00 |
| Americium 241 | | | 5.2E-10 | | 3.4E-10 | 1.7E-11 | | | | | NA | | NA | NA | - | | 8.7E-10 |
| Plutonium 239/240 | | -- | 2.7E-09 | | 1.8E-09 | NA | -- | | - | | NA | | NA | NA | | | 4.5E-09 |
| Radium 226 | | -- | NA | -- | NA | NA | -- | | | -- | NA | | NA | NA | | | 0.0E+00 |
| Uranium 233/234 | -- | -- | 2.5E-10 | -- | NA | 2.6E-11 | -- | -- | -- | - | NA | - | NA | NA | | | 2.8E-10 |
| Uranium 235 | -- | -- | 1.6E-11 | -- | NA | NA | -- | -- | -- | -- | NA | | NA | NA | | | 1.6E-11 |
| Uranium 238 | -- | -- | 2.8E-10 | -- | NA | 3.7E-11 | - | -- | -- | - | NA | | NA | NA | | | 3.2E-10 |
| | Risks by pathway | | | | | | | | | | | | | | | | |
| | 0.0E+00 | 0.0E+00 | 3.8E-09 | 0.0E+00 | 2.1E-09 | 8.0E-11 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total risk | 6.0E-09 | | | | | | | | | | | | | | | |

-- Not applicable pathway.

NA Not COC for this medium or no toxicity factor is available.

## Table 6-110
## Open Space User CT Carcinogenic Risk Factors for AOC3

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | | NA | - | NA | NA | | | - | -- | NA | | NA | NA | | | [illegible]0E 00 |
| Aluminum | - | - | NA | - | NA | NA | - | | | | NA | - | NA | NA | | | 0 0E 00 |
| Antimony | | | NA | — | NA | NA | | | | | NA | | NA | NA | | | [illegible]0E+00 |
| Aroclor-1254 | - | | NA | — | NA | NA | - | | — | | NA | | NA | NA | | | 0 0E 00 |
| Barium | - | - | NA | — | NA | NA | - | | — | - | NA | — | NA | NA | | | 0 0E 00 |
| Benzo(a)anthracene | | — | NA | - | NA | NA | | — | - | - | NA | | NA | NA | | | 0 0E+00 |
| Benzo(a)pyrene | -- | - | NA | — | NA | NA | -- | — | — | -- | NA | | NA | NA | | | 0 0E+00 |
| Benzo(b)fluoranthene | -- | — | NA | - | NA | NA | -- | | — | - | NA | | NA | NA | | | 0 0E 00 |
| Beryllium | | | NA | — | NA | NA | | | — | - | NA | | NA | NA | | | 0 0E 00 |
| Cadmium | | | NA | — | NA | NA | | | — | — | NA | -- | NA | NA | | | 0 0E 00 |
| Copper | — | — | NA | — | NA | NA | — | — | — | — | NA | - | NA | NA | | | 0 0E 00 |
| Dibenzo(a,h)anthracene | -- | — | NA | — | NA | NA | -- | | — | - | NA | | NA | NA | | | 0 0E 00 |
| 1 1 Dichloroethene | - | — | NA | - | NA | NA | — | - | — | — | NA | | NA | NA | | | 0 0E 00 |
| 1 2 Dichloroethene | | | NA | - | NA | NA | | | | | NA | | NA | NA | | | 0 0E 00 |
| Fluoranthene | — | | NA | | NA | NA | — | - | — | | NA | | NA | NA | | | [illegible] |
| Indeno(1 2 3 cd)pyrene | | | NA | | NA | NA | | | - | | NA | | NA | NA | | | [illegible] |
| Lithium | | — | NA | | NA | NA | -- | | — | | NA | - | NA | NA | | | 0 0E 00 |
| Manganese | | | NA | — | NA | NA | — | — | - | - | NA | - | NA | NA | | | 0 0E 00 |
| Mercury | | - | NA | | NA | NA | | | | | NA | | NA | NA | | | 0 0E 00 |
| Molybdenum | | | NA | | NA | NA | | | | | NA | — | NA | N | | | [illegible]E 00 |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | - | 0 0E 00 |
| Pyrene | | | NA | | NA | NA | | | - | | NA | - | NA | NA | | | [illegible]0E 00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0 0E 00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0 [illegible]E 00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | [illegible]E 00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | — | NA | NA | | | 0 0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0 0E+00 |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | | 0 [illegible]E+00 |
| Americium 241 | | | 1 9E-10 | | 1 2E-10 | 2 2E 11 | | | | | NA | — | NA | NA | | | 3 3E 10 |
| Plutonium 239/240 | | | 9 9E-10 | | 6 4E 10 | NA | - | | | - | NA | | NA | NA | | | 1 6E 09 |
| Radium 226 | — | — | NA | - | NA | NA | | | — | — | NA | - | NA | NA | | | 0 0E+00 |
| Uranium 233/234 | -- | | 9 1E-11 | | NA | 3 4E-11 | - | | — | | NA | — | NA | NA | | | 1 2E 10 |
| Uranium 235 | | | 5 9E 12 | | NA | NA | | | | | NA | | NA | NA | | | 5 9E 1[illegible] |
| Uranium 238 | | | 1 0E-10 | | NA | 4 7E-11 | | | | | NA | - | NA | NA | | | 1 5E 1[illegible] |
| Risk by pathway | 0 0E+00 | 0 0E+00 | 1 4E-09 | 0 0E+00 | 7 7E-10 | 1 0E-10 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E 00 | 0 0E 00 | |
| | Total risk | 2.3E-09 | | | | | | | | | | | | | | | |

— no applicable pathway
NA not COC for this medium or no toxicity factor available

## Table 6-111
## Construction Worker RME Noncarcinogenic HIs for AOC1

| Ch n l fC ice | I ge f S f ce So l | I ige f S bs fac S l | I ige ti f Pond Sed m | Inge ti f Seep Sedim | I ige f S ream Se lim | I g f S f W te | I g ti I Se p W te | I hal io f A rbor ie P rt l t | De mal Abso ptio f Surf ce So l | De mal Abso p f S bs rf e So l | D rmal Abso p f P nd Sed | De al Abso pt f Se p Se l m | D ial Abso pt f S re Sed t | D al Abso p f S l W | D l Abso p f Se p W | Ex ial Ra l Exp | I HI l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aceton | NA | NA | -- | - | | - | | NA | NA | NA | | NA | | | | NA | ) )E 00 |
| Al m m | NA | NA | - | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Ant mo y | NA | 5 1E-03 | -- | -- | | | | NA | NA | NA | | NA | | | | NA | 1E 03 |
| Aroclo 1254 | 8 6E-03 | 3 0E-03 | -- | | -- | | - | NA | 1 0E-02 | 3 5E-03 | | NA | | | | NA | 2 5E 02 |
| Ba m | NA | NA | -- | -- | - | | -- | NA | NA | NA | | NA | | | | NA | 0 E 00 |
| Benzo( )a thrace | NA | NA | -- | -- | | - | -- | NA | NA | NA | | NA | | | | NA | 0E 0( |
| Benzo( )pyren | NA | NA | -- | - | -- | -- | | NA | NA | NA | | NA | | | | NA | )E ( |
| Benzo(b)fluor he | NA | NA | -- | -- | -- | -- | | NA | NA | NA | | NA | | | | NA | )E |
| Berylli m | NA | 4 4E-05 | -- | -- | -- | - | - | NA | NA | NA | | NA | | | | NA | 4E 0 |
| Cadmi m | NA | 3.3E-04 | -- | -- | | - | - | NA | NA | 3 3E-05 | | NA | | | | NA | 3 7E 04 |
| Copper | 3 9E-04 | 6.2E-04 | -- | -- | - | | - | NA | NA | NA | -- | NA | | | | NA | 1 0E 03 |
| Dibenzo( h)anthracene | NA | NA | -- | -- | -- | | - | NA | NA | NA | -- | NA | | | | NA | 0 0E 00 |
| 1,1 Dichloroethene | NA | NA | -- | -- | -- | -- | - | NA | NA | NA | - | NA | | | | NA | 0 0E ) |
| 1 2-Dichloroethene | NA | NA | -- | | -- | -- | -- | NA | NA | NA | | NA | | | | NA | 0 E 00 |
| Fluora thene | 1 3E-05 | NA | -- | - | -- | -- | -- | NA | NA | NA | | NA | | | | NA | 1 3E )5 |
| Indeno(1 2,3-cd)pyrene | NA | NA | -- | -- | -- | - | -- | NA | NA | NA | -- | NA | -- | | | NA | 0 0E 00 |
| Lithium | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | | - | | NA | 0 0E+00 |
| M nganese | NA | NA | -- | -- | -- | -- | - | NA | NA | NA | - | NA | | | | NA | 0 0E 00 |
| Merc ry | 2 3E-04 | NA | - | | -- | | - | 9 3E-10 | NA | NA | | NA | | | | NA | 2 E 04 |
| Molybde | NA | 2 8E-03 | - | | -- | | -- | NA | NA | NA | | NA | | | | NA | 2 8E 03 |
| N k l | NA | 5 8E-04 | | | | | -- | NA | NA | NA | | NA | | | | NA | 5 8E 04 |
| Pyre | 1 CE 05 | NA | | | | | | NA | NA | NA | | NA | -- | | | NA | 1 6E 05 |
| l | 1 8E 04 | 2 5E 04 | | | | | | NA | NA | NA | -- | NA | | -- | | NA | 4 3E 04 |
| Si | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 E X |
| T hl l | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 0( |
| T hl h | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | ) 0E 00 |
| V ia l m | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Z nc | NA | NA | - | | | | -- | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Ame m 241 | NA | NA | -- | | | -- | -- | NA | NA | NA | | NA | | | | NA | 0 0E 00 |
| Pl ton m 239/240 | NA | NA | -- | - | -- | -- | - | NA | NA | NA | -- | NA | - | | - | NA | 0 0E 00 |
| Radium 226 | NA | NA | -- | -- | -- | | -- | NA | NA | NA | | NA | | - | | NA | 0 0E 00 |
| Uranium 233/234 | NA | NA | -- | -- | -- | | -- | NA | NA | NA | -- | NA | -- | | | NA | 0 0E 00 |
| Uranium 235 | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | -- | | | NA | 0 0E 00 |
| Uranium 238 | NA | NA | -- | -- | -- | - | -- | NA | NA | NA | -- | NA | | | | NA | 0 0E 00 |
| | HIs by pathw y | | | | | | | | | | | | | | | | |
| | 9 5E-03 | 1.3E-02 | 0.0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0.0E+00 | 9 3E-10 | 1.0E-02 | 3 5E-03 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | | | | | | | | | | | | | | | | | |
| | T tal HI. | 3 6E-02 | | | | | | | | | | | | | | | |

-- = not an applicable pathw y

NA not a COC for this medium or no toxicity factor i avail bl

## Table 6-112
## Current Worker RME Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | — | — | — | — | — | | NA | NA | | | | | | | NA | 0 0E+00 |
| Aluminum | NA | | — | | — | — | — | NA | NA | | — | — | | | | NA | 0E 00 |
| Antimony | NA | | — | — | | | | NA | NA | | | | | | | NA | 0E 00 |
| Aroclor 1254 | 7.5E-03 | — | — | — | | | — | NA | 6 1E-02 | — | | | | | | NA | 9E-02 |
| Barium | NA | — | — | — | | | — | NA | NA | — | | | | | | NA | 0 0E+00 |
| Benzo(a)anthracene | NA | | — | — | | | — | NA | NA | — | | | | | | NA | 0 0E+00 |
| Benzo(a)pyrene | NA | — | — | — | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Benzo(b)fluoranthene | NA | | — | — | — | — | — | NA | NA | | | | | | | NA | 0E 00 |
| Beryllium | NA | — | — | — | — | — | — | NA | NA | | | — | | | | NA | 0 0E+00 |
| Cadmium | NA | — | — | — | — | — | — | NA | NA | | | | | | | NA | 0 0E 00 |
| Copper | 3 4E-04 | — | — | — | — | — | — | NA | NA | | — | | | | | NA | 3 4E 04 |
| Dibenzo(a,h)anthracene | NA | | — | — | — | — | | NA | NA | | | | — | | | NA | 0 0E+00 |
| 1,1 Dichloroethene | NA | | — | — | — | — | | NA | NA | — | | | | | | NA | 0 0E+00 |
| 1 2-Dichloroethene | NA | | — | — | — | — | — | NA | NA | — | | | | | | NA | 0 0E+00 |
| Fluoranthene | 1 2E-05 | | | — | — | — | — | NA | NA | | | — | | | | NA | 1 2E-05 |
| Indeno(1,2,3-cd)pyrene | NA | | | — | — | — | — | NA | NA | | | | | | | NA | 0 0E+00 |
| [illegible] | NA | | | — | | — | — | NA | NA | | | | | | | NA | 0 0E+00 |
| Manganese | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Mercury | 2 0E-04 | — | — | | | — | | 4 6E-09 | NA | | | | | | | NA | 2 0E 04 |
| Molybdenum | NA | | | — | — | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Nickel | NA | | | | | | | NA | NA | — | | | | | | NA | 0 0E 00 |
| Pyrene | 1 4E-05 | | | | | | | NA | NA | | | | | | | NA | 1 4E-05 |
| [illegible] | 1 6E 04 | | | | | | | NA | NA | | | | | | | NA | 1 6E 04 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Vanadium | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Zinc | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Americium 241 | NA | | | | — | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Plutonium 239/240 | NA | — | | | — | — | | NA | NA | | | | | | | NA | 0E 00 |
| Radium-226 | NA | | — | | | — | | NA | NA | — | | | | | | NA | 0 0E 00 |
| Uranium 233/234 | NA | — | — | — | — | — | — | NA | NA | | — | — | — | | | NA | 0 0E+00 |
| Uranium 235 | NA | | | — | | | — | NA | NA | — | | | — | | | NA | 0 0E+00 |
| Uranium 238 | NA | — | | | | | — | NA | NA | | | | | | | NA | 0 0E+00 |
| | | | | | | | | HI by pathway | | | | | | | | | |
| | 8 2E-03 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 4 6E-09 | 6.1E-02 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |

— not applicable pathway

NA not a COC for this medium or toxicity factor is not available

## Table 6-113
## Ecological Worker RME Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediments | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | — | NA | | | — | NA | NA | | | NA | | | | NA | [illegible] |
| Aluminum | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Antimony | NA | | | 1.7E-02 | | | | NA | NA | | | NA | | | | NA | 1.7E-02 |
| Aroclor 1254 | 4.1E-03 | | — | NA | — | | | NA | 2.2E-02 | — | | NA | | | | NA | [illegible] |
| Barium | NA | — | — | NA | — | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)pyrene | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | | | NA | — | | — | NA | NA | | | NA | | | | NA | [illegible] |
| Beryllium | NA | — | — | 4.6E-05 | — | — | | NA | NA | | | NA | | | | NA | [illegible] |
| Cadmium | NA | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Copper | 1.8E-04 | — | — | NA | — | — | — | NA | NA | | | NA | | | | NA | 1.8E-04 |
| Dibenzo(a,h)anthracene | NA | — | — | NA | — | — | — | NA | NA | | | NA | — | | | NA | 0.0E+00 |
| 1,1 Dichloroethene | NA | | — | NA | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| 1,2 Dichloroethene | NA | — | — | NA | — | | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Fluoranthene | 6.4E-06 | | | NA | — | — | | NA | NA | | | NA | | | | NA | 6.4E-06 |
| Indeno(1,2,3-cd)pyrene | NA | | | NA | — | | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Lithium | NA | | — | NA | — | — | — | NA | NA | — | | NA | | | | NA | 0.0E+00 |
| Manganese | NA | | | NA | — | — | | NA | NA | — | | NA | — | | | NA | 0.0E+00 |
| Mercury | 1.1E-04 | | | NA | | | | 2.0E-09 | NA | | | NA | | | | NA | 1.1E-04 |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Pyrene | 7.6E-06 | | | NA | | | | NA | NA | | | NA | | | | NA | 7.6E-06 |
| [illegible] | [illegible] | | | NA | | | | NA | NA | | | NA | | | | NA | 8.6E-05 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Trichloroethene | NA | | | NA | — | — | — | NA | NA | — | | NA | | | | NA | 0.0E+00 |
| Vanadium | NA | | — | NA | — | — | — | NA | NA | — | | NA | — | | | NA | 0.0E+00 |
| Zinc | NA | — | — | 6.3E-05 | — | — | — | NA | NA | — | | NA | — | — | — | NA | 6.3E-05 |
| Americium 241 | NA | — | — | NA | — | — | — | NA | NA | — | | NA | — | | | NA | 0.0E+00 |
| Plutonium 239/240 | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | — | | NA | 0.0E+00 |
| Radium 226 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | | | NA | 0.0E+00 |
| Uranium-233/234 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | | | NA | 0.0E+00 |
| Uranium 235 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | — | | | NA | 0.0E+00 |
| Uranium 238 | NA | — | — | NA | | | — | NA | NA | | | NA | — | | | NA | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 4.5E-03 | 0.0E+00 | 0.0E+00 | 1.7E-02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 2.0E-09 | 2.2E-02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 4.4E-02 | | | | | | | | | | | | | | | |

— not an applicable pathway
NA not a COC for this medium or no toxicity factor is available

# Table 6-114
## Office Worker RME Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI by COC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | - | — | | — | — | - | NA | NA | | - | NA | | | — | NA | 0.0E+00 |
| Aluminum | NA | — | — | — | — | | | NA | NA | — | - | NA | — | | | NA | 0.0E+00 |
| Antimony | NA | — | — | — | | | | NA | NA | | | NA | — | | | NA | 0.0E+00 |
| Aroclor 1254 | 7.5E-03 | - | — | — | - | — | — | NA | 3.8E-02 | | | NA | — | | | NA | 4.5E-02 |
| Barium | NA | | — | — | — | - | | NA | NA | — | - | NA | — | | | NA | 0.0E+00 |
| Benzo(a)anthracene | NA | — | — | - | — | — | - | NA | NA | - | | NA | - | | | NA | 0.0E+00 |
| Benzo(a)pyrene | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Benzo(b)fluoranthene | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Beryllium | NA | — | — | — | — | — | - | NA | NA | - | — | NA | | | | NA | 0.0E+00 |
| Cadmium | NA | — | — | — | - | — | - | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Copper | 3.4E-04 | — | — | — | — | — | | NA | NA | | | NA | | | | NA | 3.4E-04 |
| Dibenzo(a,h)anthracene | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| 1,1 Dichloroethene | NA | — | — | — | — | — | | NA | NA | | - | NA | | | | NA | 0.0E+00 |
| 1,2 Dichloroethene | NA | | — | — | — | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Fluoranthene | 1.2E-05 | — | | - | — | — | — | NA | NA | - | - | NA | | | | NA | 1.2E-05 |
| Indeno(1,2,3-cd)pyrene | NA | — | - | — | — | — | | NA | NA | — | - | NA | — | | | NA | 0.0E+00 |
| Lithium | NA | | | - | — | | | NA | NA | - | | NA | - | | | NA | 0.0E+00 |
| Manganese | NA | - | | | — | - | | NA | NA | - | — | NA | | | | NA | 0.0E+00 |
| Mercury | 2.0E-04 | | | | | | | 4.6E-09 | NA | | | NA | | | | NA | 2.0E-04 |
| Molybdenum | NA | | | - | | | | NA | NA | | - | NA | | | | NA | 0.0E+00 |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | 1.4E-05 | | | | | | | NA | NA | | | NA | | | | NA | 1.4E-05 |
| [illegible] | 1.6E-04 | | | | | | | NA | NA | | | NA | | | | NA | 1.6E-04 |
| [illegible] | NA | | — | — | | | | NA | NA | | | NA | | | | NA | 0.0E+[illegible] |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | - | NA | 0.0E+[illegible] |
| T[illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Vanadium | NA | | | | - | | | NA | NA | | | NA | | — | | NA | 0.0E+00 |
| Zinc | NA | | | - | - | — | | NA | NA | - | | NA | | | | NA | 0.0E+00 |
| Americium 241 | NA | | | | | - | - | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Plutonium 239/240 | NA | - | | - | | — | — | NA | NA | - | - | NA | - | | | NA | 0.0E+00 |
| Radium 226 | NA | | - | — | - | — | | NA | NA | | - | NA | - | - | | NA | 0.0E+00 |
| Uranium 233/234 | NA | — | | - | | — | — | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Uranium 235 | NA | - | — | - | - | — | | NA | NA | | | NA | — | - | | NA | 0.0E+00 |
| Uranium 238 | NA | | - | — | — | | | NA | NA | | | NA | - | | | NA | 0.0E+00 |
| HI by pathway | 8.2E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4.6E-09 | 3.8E-02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |

— = not applicable pathway

NA = not COC for this medium or toxicity factor not available

## Table 6-115
## Adult Open Space User RME Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sed | Dermal Absorption of Seep Sed | Dermal Absorption of Stream Sed | Dermal Absorption of Surface W | Dermal Absorption of Seep W | External Rad Exposure | Total HI by COC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Aluminum | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Antimony | NA | | — | 3.1E-03 | | | | NA | NA | | | NA | | | | NA | 3.1E-03 |
| Aroclor 1254 | 7.5E-04 | | - | NA | | | | NA | 9.5E-03 | | | NA | | | | NA | [illegible] |
| Barium | NA | — | — | NA | - | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | - | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)pyrene | NA | — | — | NA | | | - | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | | — | NA | - | | — | NA | NA | | | NA | | | | NA | [illegible] |
| Beryllium | NA | | — | 8.3E-06 | — | — | | NA | NA | | | NA | | | | NA | [illegible] |
| Cadmium | NA | - | — | NA | — | — | — | NA | NA | | | NA | | | | NA | [illegible] |
| Copper | 3.4E-05 | | — | NA | | - | | NA | NA | | | NA | | | | NA | [illegible] |
| Dibenzo(a,h)anthracene | NA | - | - | NA | — | | | NA | NA | | | NA | | | | NA | [illegible] |
| 1,1-Dichloroethene | NA | — | — | NA | - | — | — | NA | NA | | | NA | | | | NA | [illegible] |
| 1,2-Dichloroethene | NA | — | — | NA | — | — | — | NA | NA | | - | NA | | | | NA | [illegible] |
| Fluoranthene | 1.2E-06 | — | — | NA | — | — | — | NA | NA | — | | NA | | | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | NA | — | — | NA | | — | — | NA | NA | — | — | NA | | | | NA | 1.2E-06 |
| Lithium | NA | — | — | NA | — | — | - | NA | NA | — | | NA | | | | NA | 0.0E+00 |
| Manganese | NA | — | — | NA | - | | — | NA | NA | — | | NA | - | | | NA | 0.0E+00 |
| Mercury | 2.0E-05 | | - | NA | — | — | | 4.9E-10 | NA | — | | NA | | | | NA | [illegible] |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 2.0E-05 |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Pyrene | 1.4[illegible] | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | 1.[illegible]E-05 | | | NA | | | - | NA | NA | | | NA | | | | NA | 1.4E-06 |
| [illegible] | NA | | | NA | - | | | NA | NA | | | NA | | | | NA | 1.6E-05 |
| T[illegible]h | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Vanadium | NA | | | NA | | | - | NA | NA | — | | NA | | — | | NA | [illegible] |
| Zinc | NA | - | - | 1.1E-05 | — | | - | NA | NA | — | | NA | | | | NA | [illegible] |
| Americium 241 | NA | — | — | NA | - | - | | NA | NA | — | — | NA | - | | | NA | 1.1E-05 |
| Plutonium 239/240 | NA | — | — | NA | — | — | — | NA | NA | — | | NA | | - | | NA | [illegible] |
| Radium 226 | NA | — | — | NA | — | - | — | NA | NA | — | | NA | | | | NA | 0.0E+00 |
| Uranium 233/234 | NA | — | — | NA | - | — | — | NA | NA | — | — | NA | | - | | NA | 0.0E+00 |
| Uranium 235 | NA | — | — | NA | — | — | — | NA | NA | — | — | NA | | — | | NA | [illegible] |
| Uranium 238 | NA | — | — | NA | — | - | — | NA | NA | — | - | NA | — | | | NA | [illegible] |
| HIs by pathway | | | | | | | | | | | | | | | | | [illegible] |
| | 8.2E-04 | 0.0E+00 | 0.0E+00 | 3.2E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4.9E-10 | 9.5E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 1.4E-02 | | | | | | | | | | | | | | | |

— not an applicable pathway

NA not a COC for this medium or no toxicity factor available

**Table 6-116**
**Child Open Space User RME Noncarcinogenic HIs for AOC1**

| Chem[illegible] [illegible] [illegible]C[illegible]ncern | Ingestio[illegible] [illegible] Surface Soil | Inge[illegible]tio[illegible] [illegible] Subs[illegible]rface So[illegible]l | Inges[illegible]io[illegible] [illegible] Pond Sediments | Inge[illegible]ti[illegible] [illegible] Se[illegible]p Sediments | Inge[illegible]tio[illegible] Stre[illegible]m Sedimen | Ingestio[illegible] [illegible] Surface W[illegible]te | I[illegible]ge[illegible]io[illegible] of Seep W[illegible]te | I[illegible]hal[illegible]tio[illegible] [illegible] A[illegible]rbor Partic[illegible]late | Dermal Absorp[illegible]io[illegible] of S[illegible]rface S[illegible]l | Absorptio[illegible] [illegible] S[illegible]b[illegible]s[illegible]rface Soil | De[illegible]mal Abs[illegible]rptio[illegible] [illegible] P[illegible]d Sed[illegible]m[illegible]t | Dermal Absorptio[illegible] [illegible] Se[illegible]p Sedim[illegible]t | Dermal Absorptio[illegible] [illegible] Stream Sedi[illegible]e[illegible] | Dermal Abs[illegible]pt[illegible] [illegible] S[illegible]rface W | De[illegible]r[illegible]al Abs[illegible]ptio[illegible] [illegible] Se[illegible]p W | Exte[illegible]al Rad Expos[illegible]re | T[illegible]tal HI[illegible]ty [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | - | - | NA | | - | | - | - | - | - | - | | | | NA | 0 0E+00 |
| Alum[illegible]um | NA | - | - | NA | | | | | | | | | | | | NA | [illegible]0E+01 |
| Antimony | NA | - | | 2 9E-02 | | | | | | | | | | | | NA | 2 [illegible] |
| Aroclor-1254 | 7.0E-03 | - | - | NA | | - | | | - | | | | | | | NA | 7 0E-03 |
| Barium | NA | - | - | NA | - | - | - | | - | - | | | | | | NA | 0 0E+00 |
| Benzo([illegible])a[illegible]thracene | NA | - | - | NA | - | - | - | - | - | - | - | | | | | NA | [illegible]0E 00 |
| Benzo([illegible])pyrene | NA | - | - | NA | | - | | - | - | | | | | | | NA | 0 [illegible] |
| Benzo(b)fluora[illegible]thene | NA | - | | NA | | | | - | | | | | | | | NA | [illegible]+00 |
| Beryll[illegible]m | NA | - | | 7.8E-05 | | - | | - | | | | | | | | NA | 7.[illegible]-05 |
| Cadm[illegible]m | NA | | | NA | - | | | | | | | | - | | | NA | [illegible]0E 00 |
| Copper | 3 1E-04 | | | NA | | | | | | | | | | | | NA | [illegible]E 04 |
| Dibenzo([illegible]h)anthracene | NA | | | NA | | | - | - | | | | | | | | NA | [illegible]0E+01 |
| 1 1 Dichloroethene | NA | | - | NA | - | - | - | | | | | | | | | NA | 0 0E 00 |
| 1 2 Dichloroethene | NA | - | | NA | - | - | - | - | | | | | | | | NA | 0 0E 00 |
| Fluoranthene | 1 1E-05 | | | NA | | - | - | - | - | | | | | | | NA | 1 1E-05 |
| Indeno(1 2,3-cd)pyrene | NA | | | NA | - | - | | - | - | | - | | | | | NA | 0 0E+00 |
| [illegible]h[illegible]m | NA | | - | NA | | - | | - | - | | - | | | | | NA | 0 0E+00 |
| M[illegible]ng[illegible]nese | NA | | | NA | | | | | | | | | | | | NA | 0 0E+00 |
| Merc[illegible]ry | 1 8E 04 | | | NA | | | | | | | | | | | | NA | 1 8E-04 |
| M[illegible]lybde[illegible]m | NA | | | NA | | | | | | | | | | | | NA | [illegible]0E+00 |
| N[illegible] | NA | | | NA | | | | | | | | | | | | NA | 0 0E 00 |
| [illegible] | 1 3E 05 | | | NA | | | | - | | | | - | | | | NA | 1 3E 05 |
| [illegible] | 1 5E 04 | | | NA | | | | | | | | | | | | NA | 1 5E-04 |
| [illegible] | NA | | | NA | | | | | | | | | | | | NA | 0 0E+00 |
| T[illegible] | NA | | | NA | | | | | | | | | | | | NA | 0 0E+00 |
| T[illegible]h[illegible] | NA | | | NA | | | | | - | | | | - | | | NA | 0 0E 00 |
| V[illegible]adi[illegible]m | NA | | | NA | | | | - | | | | | | | | NA | 0 0E+00 |
| Z[illegible] | NA | - | | 1 1E-04 | - | - | | | - | | | | | | | NA | 1 1E-04 |
| Americ[illegible]m 241 | NA | | | NA | - | - | | - | - | - | | | | | | NA | 0 0E 00 |
| Pl[illegible]ton[illegible]m-239/240 | NA | - | - | NA | - | | - | - | - | | - | | - | | | NA | 0 0E 00 |
| Radi[illegible]m 226 | NA | | | NA | - | - | - | - | - | | | | - | | | NA | 0 0E 00 |
| Urani[illegible]m 233/234 | NA | - | | NA | - | | - | - | | - | | | | | | NA | 0 0E+00 |
| Urani[illegible]m 235 | NA | - | | NA | - | - | | - | | | | | - | | | NA | 0 0E+00 |
| Uranium 238 | NA | | | NA | | - | | | - | | | | | | | NA | 0 0E+00 |
| | HI by pathw[illegible]y | | | | | | | | | | | | | | | | |
| | 7 7E-03 | 0 0E+00 | 0 0E+00 | 2 9E-02 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | |
| | T[illegible] [illegible]HI | 3 7E-02 | | | | | | | | | | | | | | | |

[illegible] not [illegible]ppl[illegible]bl[illegible] p[illegible]thw[illegible]y
NA [illegible]t COC f[illegible] th[illegible] medium [illegible]to[illegible]ty facto[illegible] [illegible]ail[illegible]bl[illegible]

## Table 6-117
## Construction Worker CT Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Aluminum | NA | NA | - | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Antimony | NA | 9.0E-04 | | | | | | NA | NA | NA | | NA | | | | NA | 9.0E-04 |
| Aroclor 1254 | 1.5E-03 | 5.3E-04 | — | | | | | NA | 1.8E-03 | 6.3E-04 | | NA | | | | NA | 4.[illegible]E-03 |
| Barium | NA | NA | | - | | - | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Benzo(a)anthracene | NA | NA | — | — | | — | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Benzo(a)pyrene | NA | NA | — | | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Beryllium | NA | 7.8E-06 | — | - | - | | | NA | NA | NA | | NA | | | | NA | 7.8E-06 |
| Cadmium | NA | 5.9E-06 | — | — | — | | - | NA | NA | 5.9E-06 | | NA | | | | NA | 6.5E-05 |
| Copper | 6.9E-05 | 1.1E-04 | — | — | — | — | - | NA | NA | NA | | NA | | | | NA | 1.8E-04 |
| Dibenzo(a,h)anthracene | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| 1,1-Dichloroethene | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| 1,2-Dichloroethane | NA | NA | - | | — | - | - | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Fluoranthene | 2.4E-06 | NA | — | — | | | — | NA | NA | NA | | NA | | | | NA | 2.4E-06 |
| Indeno(1,2,3-cd)pyrene | NA | NA | — | - | | — | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Lithium | NA | NA | | - | - | | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Manganese | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Mercury | 4.0E-05 | NA | | | | | | 7.5E-10 | NA | NA | | NA | | | | NA | 4.0E-05 |
| Molybdenum | NA | 5.0E-04 | | | | | | NA | NA | NA | | NA | | | | NA | 5.[illegible]E-04 |
| N[illegible] | NA | 1.[illegible]E-04 | | | | | - | NA | NA | NA | | NA | | | | NA | 1.0E-04 |
| Pyrene | [illegible]8E-06 | NA | | | | | | NA | NA | NA | | NA | | | | NA | 2.8E-06 |
| [illegible] | 3.2E-05 | 4.5E-05 | | | | | | NA | NA | NA | | NA | | | | NA | 7.7E-05 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| V[illegible] | NA | NA | | | | | - | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Z[illegible] | NA | NA | | | | | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| A[illegible] 241 | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Plutonium 239/240 | NA | NA | - | | — | | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Radium 226 | NA | NA | — | - | - | | — | NA | NA | NA | - | NA | | | | NA | 0.0E+00 |
| Uranium 233/234 | NA | NA | — | — | — | - | — | NA | NA | NA | — | NA | | | | NA | 0.0E+00 |
| Uranium 235 | NA | NA | — | — | — | - | — | NA | NA | NA | | NA | — | | | NA | 0.0E+00 |
| Uranium 238 | NA | NA | — | — | — | — | — | NA | NA | NA | | NA | — | | | NA | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 1.7E-03 | 2.3E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 7.5E-10 | 1.8E-03 | 6.3E-04 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | | | | | | | | | | | | | | | | | |
| | Total HI | 6.4E-03 | | | | | | | | | | | | | | | |

— = not an applicable pathway

NA = not a COC for this medium or no toxicity factor is available

**Table 6 118**

**Current Worker CT Noncarcinogenic HI for AOC1**

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Aluminum | NA | | -- | | | | -- | NA | NA | | | | | | | NA | 0 0E+00 |
| Antimony | NA | | -- | - | | - | | NA | NA | | | | | | | NA | 0 0E+00 |
| Aroclor-1254 | 1 2E-03 | - | -- | | -- | - | | NA | 9 7E-03 | | | | - | | | NA | 1 1E-02 |
| Barium | NA | - | -- | - | -- | -- | - | NA | NA | -- | | | | | | NA | 0 0E+00 |
| Benzo(a)anthracene | NA | -- | -- | -- | -- | - | - | NA | NA | | | | -- | | | NA | 0 0E+00 |
| Benzo(a)pyrene | NA | | - | -- | -- | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Benzo(b)fluoranthene | NA | - | -- | - | - | | | NA | NA | -- | | | | | | NA | 0 0E+00 |
| Beryllium | NA | | -- | -- | -- | -- | -- | NA | NA | | - | - | | | | NA | 0 0E+00 |
| Cadmium | NA | | -- | -- | -- | - | -- | NA | NA | | - | | | | | NA | 0 0E+00 |
| Copper | 5.3E-05 | | -- | -- | -- | -- | -- | NA | NA | | | | | | | NA | 5 3E-05 |
| Dibenz(a,h)anthracene | NA | -- | -- | -- | -- | -- | -- | NA | NA | | | - | | -- | | NA | 0 0E+00 |
| 1 1 Dichloroethene | NA | -- | -- | -- | -- | -- | | NA | NA | | | | | | | NA | 0 0E+00 |
| 1,2 Dichloroethene | NA | | - | | -- | -- | - | NA | NA | | | | | | | NA | 0 0E+00 |
| Fluoranthene | 1.8E-06 | -- | | - | -- | -- | -- | NA | NA | | | - | | | | NA | 1 8E-06 |
| Indeno(1,2,3-cd)pyrene | NA | - | -- | | - | -- | -- | NA | NA | | | | | | | NA | 0 0E+00 |
| Lithium | NA | | | -- | -- | - | | NA | NA | | | | | | | NA | 0 0E+00 |
| Manganese | NA | | - | -- | -- | -- | -- | NA | NA | | | | -- | | | NA | 0 0E+00 |
| Mercury | 3 1E-05 | | | | - | | -- | 3 6E-09 | NA | | | | | | | NA | 3 1E-05 |
| Molybdenum | NA | | | | -- | | -- | NA | NA | | | | | | | NA | 0 0E+00 |
| Nickel | NA | | | | - | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Pyrene | 2 2E-06 | | | | | | | NA | NA | | | | | | | NA | 2 2E-06 |
| [illegible] | 2 5E-05 | | | | | | | NA | NA | | | -- | | | | NA | 2 5E-05 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Tetrachloroethene | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Trichloroethene | NA | | | | | | | NA | NA | | | -- | | | | NA | 0 0E+00 |
| Vanadium | NA | | | | | | | NA | NA | | | | -- | | | NA | 0 0E+00 |
| Zinc | NA | | | | - | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Americium 241 | NA | | | | | | - | NA | NA | | | | | | | NA | 0 0E+00 |
| Plutonium 239/240 | NA | | - | | -- | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Radium 226 | NA | -- | | - | -- | - | -- | NA | NA | | | -- | | | | NA | 0 0E+00 |
| Uranium 233/234 | NA | -- | -- | | -- | - | -- | NA | NA | -- | | -- | - | | | NA | 0 0E+00 |
| Uranium 235 | NA | -- | -- | -- | -- | -- | - | NA | NA | | | -- | | | | NA | 0 0E+00 |
| Uranium 238 | NA | -- | | -- | -- | | | NA | NA | - | | | - | | | NA | 0 0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 1 3E-03 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0.0E+00 | 3 6E-09 | 9 7E-03 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | Total HI | 1 1E-02 | | | | | | | | | | | | | | | |

-- = not applicable pathway

NA = not COC for this medium or no toxicity factor is available

## Table 6-119
## Ecological Worker CT Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Rad Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Aluminum | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Antimony | NA | | | 4.8E-03 | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Aroclor 1254 | 1.2E-03 | | | NA | | | | NA | 4.0E-03 | | | NA | | | | NA | [illegible] |
| Barium | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)pyrene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Beryllium | NA | | | 1.3E-05 | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Cadmium | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Copper | 5.2E-05 | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Dibenzo(a,h)anthracene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| 1,1-Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| 1,2-Dichloroethene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Fluoranthene | 1.8E-06 | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Indeno(1,2,3-cd)pyrene | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Lithium | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Manganese | NA | | | NA | | | | 1.1E-09 | NA | | | NA | | | | NA | [illegible] |
| Mercury | 3.0E-05 | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Molybdenum | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Nickel | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | 2.1E-[illegible] | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | 2.4E-05 | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 1.8E-05 |
| Z[illegible] | NA | | | 1.8E-05 | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Americium 241 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Plutonium 239/240 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Radium 226 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Uranium 233/234 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Uranium 235 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Uranium 238 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 1.3E-03 | 0.0E+00 | 0.0E+00 | 4.9E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.1E-09 | 4.0E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 1.0E-02 | | | | | | | | | | | | | | | |

— not an applicable pathway
NA not a COC for this medium or no toxicity factor is available

## Table 6-120
## Office Worker CT Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI per chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | — | — | — | — | — | NA | NA | — | | NA | — | | | NA | 0 0E+00 |
| Aluminum | NA | | | — | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Antimony | NA | — | — | — | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Aroclor-1254 | 5 9E-04 | — | — | — | — | — | — | NA | 6 0E-03 | — | | NA | | | | NA | 6 6E-03 |
| Barium | NA | — | — | — | | — | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Benzo(a)anthracene | NA | — | — | — | — | | — | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Benzo(a)pyrene | NA | | — | — | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Benzo(b)fluoranthene | NA | | | — | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Beryllium | NA | — | | — | — | — | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Cadmium | NA | | — | — | | — | — | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Copper | 2 6E-05 | | — | — | — | — | | NA | NA | | | NA | | | | NA | 2 6E-05 |
| Dibenzo(a,h)anthracene | NA | — | — | — | — | — | | NA | NA | — | — | NA | | — | | NA | 0 0E+00 |
| 1,1-Dichloroethene | NA | — | — | — | — | — | — | NA | NA | | | NA | | — | | NA | 0 0E+00 |
| 1,2-Dichloroethene | NA | | — | | — | — | — | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Fluoranthene | 9 1E-07 | — | — | — | — | | | NA | NA | | | NA | | | | NA | 9 1E-07 |
| Indeno(1,2,3-cd)pyrene | NA | | | — | — | — | — | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Lithium | NA | — | — | — | — | — | — | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Manganese | NA | — | — | — | — | | — | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Mercury | 1 5E-05 | | | — | | — | — | 2 8E-09 | NA | | | NA | | | | NA | 1 5E-05 |
| Molybdenum | NA | | | — | | | | N | NA | | | NA | | | | NA | 0 0E+00 |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Pyrene | 1 1E- | | | | | | | NA | NA | | | NA | | | | NA | 1 1E-06 |
| Selenium | 1 2E-05 | | | | | | | NA | NA | | | NA | | | | NA | 1 2E-05 |
| Silver | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Tetrachloroethene | N | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Trichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Vanadium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Zinc | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Americium-241 | NA | | | — | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Plutonium-239/240 | NA | — | | — | | — | — | NA | NA | | — | NA | | | | NA | 0 0E+00 |
| Radium-226 | NA | — | | — | — | | — | NA | NA | — | | NA | | | | NA | 0 0E+00 |
| Uranium-233/234 | NA | — | — | — | — | — | | NA | NA | | | NA | — | | | NA | 0 0E+00 |
| Uranium-235 | NA | | — | — | — | — | — | NA | NA | — | | NA | | | | NA | 0 0E+00 |
| Uranium-238 | NA | — | — | — | — | | — | NA | NA | | — | NA | | | | NA | 0 0E+00 |
| | HI by pathway | | | | | | | | | | | | | | | | |
| | 6 5E-04 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 2 8E-09 | 6 0E-03 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | Total HI | 6 6E-03 | | | | | | | | | | | | | | | |

— = not applicable to this pathway
NA = not a COC for this medium or no toxicity factor available for HI

## Table 6-121
## Adult Open Space User CT Noncarcinogenic HIs for AOC1

| Ch m l f C nce | I ige f Su f ce So l | Inge f Subs f ce So l | Inge u f Pond Sed m s | I ige f Seep Sedim | I ge u f Stre m Sed m | I g i f S face W te | I ge f Seep W te | I hala w f Ai bur e P rti l e | De mal Abso ptio f S face So l | De mal Abso pt f S bs rfac So l | D m l Abso p f P nd Sed m | De mal Absorp f Se p Sed | D mal Abso p f S re m Sed | I l Abso p f S t e W | D al Abso p f Se p W | E al Rad E po re | I l HI t y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | — | NA | NA | | | NA | | | | NA | 0 0E )0 |
| Al mi m | NA | — | — | NA | | | - | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Ant mo y | NA | | - | 6.3E-04 | | | | NA | NA | - | | NA | | | | NA | 6 IE 4 |
| Aroclo 1254 | 1 5E-04 | | — | NA | | | — | NA | 1 4E-04 | | | NA | | | | NA | 2 JE 4 |
| Bari m | NA | - | — | NA | | | | NA | NA | | | NA | | | | NA | ) )E ) |
| Be zo( )a th acene | NA | - | | NA | | | | NA | NA | | | NA | | | | NA | ) E |
| Benzo( )pyrene | NA | — | — | NA | — | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Benzo(b)fluor thene | NA | — | — | NA | — | — | — | NA | NA | | | NA | - | | | NA | 0 0E |
| Berylli m | NA | — | — | 1 7E-06 | — | - | — | NA | NA | | | NA | | | | NA | 1 7E 06 |
| Cadm m | NA | — | — | NA | - | — | — | NA | NA | | | NA | | | | NA | 0 0E )0 |
| Copper | 6 7E-06 | — | - | NA | - | — | — | NA | NA | - | - | NA | | | | NA | 6 7E 06 |
| Dibenzo( h) hracene | NA | - | — | NA | — | - | — | NA | NA | | — | NA | — | | | NA | 0 0E 00 |
| 1,1 Dichloroethene | NA | — | | NA | — | - | — | NA | NA | | | NA | | | | NA | 0 E 00 |
| 1 2-Dichloroethene | NA | | — | NA | - | - | - | NA | NA | | | NA | | | | NA | )E K |
| Fluora thene | 2.3E-07 | - | | NA | — | — | - | NA | NA | | | NA | | | | NA | 2 3E 07 |
| Indeno(1 2,3-cd)pyrene | NA | — | | NA | — | — | - | NA | NA | | | NA | | | | NA | )0E 00 |
| Lithi m | NA | - | | NA | — | — | - | NA | NA | | | NA | | | | NA | 0 E 0( |
| M ng nese | NA | | — | NA | — | — | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| M rc ry | 3 9E-06 | | | NA | — | — | | 3 5E-11 | NA | | | NA | | | | NA | 3 9E 06 |
| M lybde | NA | | | NA | | | | NA | NA | - | | NA | | | | NA | 0 E 00 |
| N k l | NA | | | NA | — | | | NA | NA | — | | NA | | | | NA | 0 )E 0( |
| Pyre | 2 8E 07 | | | NA | | | | NA | NA | | | NA | | | | NA | 2 8E 07 |
| [illegible] | 3 1E-06 | | | NA | | | | NA | NA | | | NA | | | | NA | 3 1E 06 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0E 00 |
| V adi | NA | | | NA | | | - | NA | NA | | — | NA | | | | NA | 0 0E 00 |
| Z | NA | | | 2.3E-06 | | | | NA | NA | | | NA | | | | NA | 2 3E 06 |
| Ame m 241 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Pluton m 239/240 | NA | | - | NA | — | | | NA | NA | | — | NA | | | | NA | 0 0E 0( |
| Radi m 226 | NA | | - | NA | — | | | NA | NA | | | NA | | | | NA | 0E |
| Uran m-233/234 | NA | | | NA | - | — | — | NA | NA | | | NA | | | | NA | 0E 0( |
| Urani m 235 | NA | — | — | NA | | — | — | NA | NA | — | | NA | | | | NA | 0 0E )0 |
| Urani m 238 | NA | - | — | NA | — | — | — | NA | NA | — | | NA | — | | | NA | 0 0E 00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 1 6E-04 | 0 0E+00 | 0.0E+00 | 6.3E-04 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 3.5E-11 | 1 4E-04 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | - |

— not an pplicabl pathw y

NA not a COC for this medium or no toxicity factor is a ailabl

## Table 6-122
## Child Open Space User CT Noncarcinogenic HIs for AOC1

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediments | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| Aluminum | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| Antimony | NA | | | 5.9E-03 | | | | | | | | | | | | | 5.9E-03 |
| Aroclor-1254 | 1.4E-03 | | | NA | | | | | | | | | | | | | 1.4E-03 |
| Barium | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| Benzo(a)anthracene | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| Benzo(a)pyrene | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| Benzo(b)fluoranthene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Beryllium | NA | | | 1.6E-06 | | | | | | | | | | | | | 1.6E-06 |
| Cadmium | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Copper | 6.3E-05 | | | NA | | | | | | | | | | | | | 6.3E-05 |
| Dibenz(a,h)anthracene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| 1,1-Dichloroethene | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| 1,2-Dichloroethene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Fluoranthene | 2.2E-06 | | | NA | | | | | | | | | | | | | 2.2E-06 |
| Indeno(1,2,3-cd)pyrene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Lithium | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Manganese | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Mercury | 3.7E-05 | | | NA | | | | | | | | | | | | | 3.7E-05 |
| Molybdenum | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Nickel | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Py[illegible] | 2.6E-06 | | | NA | | | | | | | | | | | | | 2.6E-06 |
| [illegible] | 2.9E-05 | | | NA | | | | | | | | | | | | | 2.9E-05 |
| [illegible] | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| [illegible] | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| [illegible] | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| [illegible] | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| [illegible] | NA | | | 2.1E-05 | | | | | | | | | | | | | 2.1E-05 |
| Americium-241 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Plutonium-239/240 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Radium-226 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Uranium-233/234 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Uranium-235 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Uranium-238 | NA | | | NA | | | | | | | | | | | | | 0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 1.5E-03 | 0.0E+00 | 0.0E+00 | 5.9E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 7.4E-03 | | | | | | | | | | | | | | | |

– not an applicable pathway
NA not a COC for this medium or toxicity factor not available

# Table 6-123
## Construction Worker RME Noncarcinogenic HIs for AOC2

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | — | — | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Aluminum | NA | NA | | — | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Antimony | NA | 6.7E-03 | | | | | | NA | NA | NA | | NA | | | | NA | 6.7E-03 |
| Aroclor 1254 | NA | NA | | — | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Barium | NA | NA | — | - | — | — | - | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Benzo(a)anthracene | NA | NA | — | — | | — | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Benzo(a)pyrene | NA | NA | — | — | | - | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | NA | - | - | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Beryllium | NA | 7.3E-05 | - | — | | | - | NA | NA | NA | | NA | | | | NA | 7.3E-05 |
| Cadmium | NA | 7.1E-04 | — | — | — | — | — | NA | NA | 7.0E-05 | - | NA | | | | NA | 7.8E-04 |
| Copper | 2.6E-04 | 5.8E-04 | — | — | — | — | — | NA | NA | NA | - | NA | - | | | NA | 8.3E-04 |
| Dibenzo(a,h)anthracene | NA | NA | - | — | - | - | - | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| 1,1 Dichloroethene | NA | NA | — | — | — | | - | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| 1,2 Dichloroethene | NA | NA | — | | | — | | NA | NA | NA | - | NA | | | | NA | 0.0E+00 |
| Fluoranthene | 6.3E-07 | NA | — | - | | | — | NA | NA | NA | | NA | | | | NA | 6.3E-07 |
| Indeno(1,2,3-cd)pyrene | NA | NA | | — | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Lithium | NA | NA | - | | | | - | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Manganese | NA | NA | — | - | | — | — | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Mercury | 1.5E-04 | NA | - | | | | | 5.4E-13 | NA | NA | | NA | | | | NA | 1.5E-04 |
| Molybdenum | NA | 2.5E-03 | | | | | | NA | NA | NA | | NA | | | | NA | 2.5E-03 |
| Nickel | NA | 6.4E-04 | | | | | | NA | NA | NA | | NA | | | | NA | 6.4E-04 |
| Pyrene | 1.0E-06 | NA | | | | | | NA | NA | NA | | NA | - | | | NA | 1.0E-06 |
| [illegible] | 1.8E-04 | 4.8E-04 | | | | | | NA | NA | NA | | NA | | | | NA | 6.6E-04 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | - | | NA | 0.0E+00 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Vanadium | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0.0E+00 |
| Zinc | NA | NA | | | | | - | NA | NA | NA | | NA | - | | | NA | 0.0E+00 |
| Americium-241 | NA | NA | | | | - | — | NA | NA | NA | - | NA | | | | NA | 0.0E+00 |
| Plutonium-239/240 | NA | NA | — | - | — | | - | NA | NA | NA | | NA | — | | | NA | 0.0E+00 |
| Radium-226 | NA | NA | - | — | — | | - | NA | NA | NA | | NA | - | | | NA | 0.0E+00 |
| Uranium-233/234 | NA | NA | — | — | — | — | — | NA | NA | NA | — | NA | | | | NA | 0.0E+00 |
| Uranium-235 | NA | NA | | | - | — | — | NA | NA | NA | — | NA | | | | NA | 0.0E+00 |
| Uranium-238 | NA | NA | — | | — | - | - | NA | NA | NA | — | NA | | | — | NA | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 5.9E-04 | 1.2E-02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 5.4E-13 | 0.0E+00 | 7.0E-05 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 1.2E-02 | | | | | | | | | | | | | | | |

— not an applicable pathway

NA not COC for this medium, no toxicity factors available

## Table 6-124
## Current Worker RME Noncarcinogenic HIs for AOC2

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediments | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Aluminum | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Antimony | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Aroclor-1254 | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Barium | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Benzo(a)pyrene | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Beryllium | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 0[illegible] |
| Cadmium | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Copper | 2 2E-04 | | | | | | | NA | NA | | | | | | | NA | 2 [illegible]E-04 |
| Dibenzo(a,h)anthracene | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| 1,1 Dichloroethene | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| 1,2 Dichloroethene | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Fluoranthene | 5 4E-07 | | | | | | | NA | NA | | | | | | | NA | 5 4E-07 |
| Indeno(1,2,3-cd)pyrene | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Lithium | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 0[illegible] |
| Manganese | NA | | | | | | | NA | NA | | | | | | | NA | 0E 00 |
| Mercury | 1 3E-04 | | | | | | | 2 7E-12 | NA | | | | | | | NA | 1 3E 04 |
| Molybdenum | N | | | | | | | NA | NA | | | | | | | NA | 0E 00 |
| N k l | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 0[illegible] |
| I y | 7[illegible] 7 | | | | | | | NA | NA | | | | | | | NA | 8 7E-07 |
| [illegible] | 1 5E-04 | | | | | | | NA | NA | | | | | | | NA | 1 5E-04 |
| [illegible] | N | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| T | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 0[illegible] |
| T | NA | | | | | | | NA | NA | | | | | | | NA | 0E 00 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Z | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 0[illegible] |
| A m l | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Plutonium 239/240 | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Radium 226 | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Uranium 233/234 | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| Uranium 235 | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E 00 |
| Uranium 238 | NA | | | | | | | NA | NA | | | | | | | NA | 0 0E+00 |
| HI by pathway | 5 1E-04 | 0 0E 00 | 0 0E+00 | 0 0E 00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 2 7E 12 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E 00 | 0 0E 00 | 0E 00 | |
| Total HI | 5 1E 04 | | | | | | | | | | | | | | | | |

-- pplicabl p thw y

NA not COC fo hi medi m no toxic y facto l ble

**Table 6-125**

**Ecological Worker RME Noncarcinogenic HIs for AOC2**

| Ch l f C | Inge f S f ce Soil | Ing ti f S bs f Soil | I ge t f P d Sed | I ge t f Se p Sed | Ing f S n Sed | I g f S f c W | I g f Se p W | I hal tio f A bor Pa t | De nal Abso p f S f ce Soil | Dermal Abso pt f S b f Soil | De mal Al f P d Sed | De m l Abs p f Se p Sed | De al Abso p f S re Sed | D l Abso p f S f W | D e l Abso p f Se p W | Ex l Rad | T HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A ton | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Al m m | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Ant mo y | NA | | - | 1 5E-02 | | | | NA | NA | | | NA | | | | NA | 1 5[illegible] |
| Aroclo 1254 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Ba m | NA | - | - | NA | - | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Benzo( )a h ce | NA | | - | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo( )pyren | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(b)fl or hene | NA | | - | NA | | | - | NA | NA | | | NA | | | | NA | [illegible] |
| Beryll m | NA | | | 4 0E-05 | - | | - | NA | NA | | | NA | | | | NA | 4 0E 05 |
| Cadm m | NA | - | - | NA | - | - | - | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Copper | 1 2E-04 | - | - | NA | - | - | - | NA | NA | | | NA | | | | NA | 1 2E 04 |
| Dibenzo( h)a thracene | NA | - | - | NA | - | - | - | NA | NA | | | NA | | | | NA | [illegible]0E 00 |
| 1 1 Dichloroethene | NA | | - | NA | - | - | - | NA | NA | | | NA | | | | NA | 0 0E 00 |
| 1 2 Dichloroethene | NA | - | - | NA | - | | - | NA | NA | - | | NA | | | | NA | 0 0E 00 |
| Fluora thene | 3 0E-07 | - | - | NA | - | - | | NA | NA | - | | NA | | | | NA | 3 0E 07 |
| Indeno(1 2,3-cd)pyrene | NA | - | | NA | | | - | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Lithium | NA | - | - | NA | - | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Manganese | NA | - | - | NA | - | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Merc ry | 7 2E-05 | | | NA | | | | 1 2E-12 | NA | | | NA | | | | NA | 7 2E 05 |
| M lybde | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0E 0[illegible] |
| N k l | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 [illegible] 00 |
| Pyre | 4 8E 07 | | | NA | | | | NA | NA | | | NA | | | | NA | 4 8E 07 |
| [illegible] | 8 5E 05 | | | NA | | | | NA | NA | | | NA | | | | NA | 8 5E 05 |
| S[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| T [illegible] | NA | | | NA | | | | NA | NA | - | | NA | | | | NA | 0 0E+00 |
| T h h ie | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| [illegible] m | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Zi[illegible] | NA | | | 9 4E-04 | | | - | NA | NA | | | NA | | | | NA | 9 4E 04 |
| A ic 41 | NA | | - | NA | - | | - | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Pl ton m 239/240 | NA | - | - | NA | - | | - | NA | NA | | | NA | | - | | NA | 0 0E 00 |
| Radi m 226 | NA | | - | NA | - | - | - | NA | NA | - | | NA | - | | | NA | 0 0E 00 |
| Urani m 233/234 | NA | - | - | NA | - | - | - | NA | NA | - | | NA | | - | | NA | 0 0E 00 |
| Urani m 235 | NA | - | - | NA | - | - | - | NA | NA | - | - | NA | - | | | NA | 0 0E 00 |
| Uranium 238 | NA | - | - | NA | - | - | - | NA | NA | - | - | NA | | | - | NA | 0 0E 00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 2.8E-04 | 0.0E+00 | 0 0E+00 | 1.6E-02 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 1.2E-12 | 0.0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | Total HI. | 1 6E-02 | | | | | | | | | | | | | | | |

- not an applicable pathway

NA not COC for this medi m or no toxicity facto is ailable.

## Table 6-126
## Office Worker RME Noncarcinogenic HIs for AOC2

| | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation | Total HI by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | NA | | | | NA | 0E+00 |
| Aluminum | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Antimony | NA | | | | | | | NA | NA | | | NA | | | | NA | 0E+00 |
| Aroclor 1254 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Barium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Benzo(a)anthracene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0E 00 |
| Benzo(a)pyrene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Benzo(b)fluoranthene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0E+00 |
| Beryllium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Cadmium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Copper | 2 2E-04 | | | | | | | NA | NA | | | NA | | | | NA | 2 2E 04 |
| Dibenzo(a,h)anthracene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| 1,1 Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| 1 2-Dichloroethene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Fluoranthene | 5 4E-07 | | | | | | | NA | NA | | | NA | | | | NA | 5 4E-07 |
| Indeno(1,2,3-cd)pyrene | NA | | | | | | | NA | NA | | | NA | | | | NA | 0E+00 |
| Lithium | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Manganese | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Mercury | 1 3E-04 | | | | | | | NA | NA | | | NA | | | | NA | 1 3E 04 |
| Molybdenum | NA | | | | | | | 2.7E-12 | NA | | | NA | | | | NA | 1 E 01 |
| Nickel | NA | | | | | | | NA | NA | | | NA | | | | NA | 0E 01 |
| Py | 7E 7 | | | | | | | NA | NA | | | NA | | | | N | 8 7E-07 |
| [illegible] | 1 E 04 | | | | | | | NA | NA | | | NA | | | | NA | 1 5E 04 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 01 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 E 00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | E+00 |
| Americium 241 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| Plutonium 239/240 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Radium 226 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Uranium 233/234 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Uranium 235 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E 00 |
| Uranium 238 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0 0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 5 1E-04 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 2.7E-12 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E+00 | 0 0E 00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | Total HI | 5 1E-04 | | | | | | | | | | | | | | | |

- not applicable pathway
NA not COC for this medium or no toxicity factor available

**Table 6-127**
**Adult Open Space User RME Noncarcinogenic HIs for AOC2**

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aceto[illegible] | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Al[illegible]m | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| A[illegible]m[illegible]y | NA | | | 2.7E-03 | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Aroclo[illegible] 1254 | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Bari[illegible]m | NA | | - | NA | - | | — | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo( )a[illegible]thra[illegible]e | NA | | — | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo( )pyrene | NA | | — | NA | — | | | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(b)fluor[illegible]thene | NA | | — | NA | - | — | — | NA | NA | | - | NA | | | | NA | [illegible] |
| Beryll[illegible]um | NA | — | — | 7.3E-06 | — | — | - | NA | NA | | | NA | | | | NA | [illegible] |
| Cadm[illegible]m | NA | — | - | NA | - | | - | NA | NA | | | NA | | | | NA | [illegible] |
| Copper | 2.2E-05 | - | — | NA | — | - | — | NA | NA | | | NA | | | | NA | 2.2E-05 |
| Dibenzo( h)a[illegible]thrace[illegible]e | NA | — | — | NA | — | — | - | NA | NA | | | NA | | | | NA | 0.0E+00 |
| 1,1 Dichloroethe[illegible]e | NA | — | — | NA | - | — | - | NA | NA | | | NA | — | | | NA | 0.0E+00 |
| 1,2 Dichloroethene | NA | — | - | NA | — | - | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Fluoranthene | 5.4E-08 | | | NA | - | - | | NA | NA | | | NA | | | | NA | 5.4E-08 |
| Indeno(1,2,3-cd)pyrene | NA | — | — | NA | — | | - | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Lith[illegible]m | NA | | | NA | - | — | - | NA | NA | | - | NA | | | | NA | 0.0E+00 |
| Manganese | NA | — | | NA | — | | - | NA | NA | - | | NA | | | | NA | 0.0E+00 |
| Mercury | 1.3E-05 | | - | NA | | | — | 2.8E-13 | NA | | | NA | | | - | NA | [illegible] |
| Molybde[illegible]m | NA | - | | NA | — | - | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| N[illegible]k[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Pyre[illegible] | 8.7E-08 | | | NA | | | | NA | NA | | | NA | | | | NA | 8.7E-08 |
| [illegible] | 1.5E-05 | | | NA | | | - | NA | NA | | | NA | | | | NA | 1.5E-05 |
| | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | 1.7E-04 | | | | NA | NA | | | NA | | | | NA | 1.7E-04 |
| Ame[illegible] 2[illegible]1 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Pl[illegible]tu[illegible]n 239/240 | NA | | | NA | | | - | NA | NA | | - | NA | | | | NA | 0.0E+00 |
| Radium 226 | NA | | | NA | — | | - | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Uranium 233/234 | NA | — | — | NA | — | — | — | NA | NA | | — | NA | | | | NA | 0.0E+00 |
| Urani[illegible]m 235 | NA | — | — | NA | — | | — | NA | NA | — | — | NA | | | — | NA | 0.0E+00 |
| Urani[illegible]m 238 | NA | — | — | NA | | — | | NA | NA | | — | NA | - | - | - | NA | 0.0E+00 |
| | | | | | | | | HIs by pathway | | | | | | | | | |
| | 5.1E-05 | 0.0E+00 | 0.0E+00 | 2.8E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 2.8E-13 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | | | | | | | | | | | | | | | | | |
| | Total HI | 2.9E-03 | | | | | | | | | | | | | | | |

— not an applicable pathway
NA not a COC for this medium or no toxicity factor is available

## Table 6-128
## Child Open Space User RME Noncarcinogenic HIs for AOC2

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Rad Exposure | Total HI by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Aluminum | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Antimony | NA | | | 2.5E-02 | | | | | | | | | | | | | 2.5E-02 |
| Aroclor 1254 | NA | | | NA | | | | | | | | | | | | | [illegible] |
| Barium | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Benzo(a)anthracene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Benzo(a)pyrene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Benzo(b)fluoranthene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Beryllium | NA | | | 6.8E-05 | | | | | | | | | | | | | 0.0E+00 |
| Cadmium | NA | | | NA | | | | | | | | | | | | | 6.8E-05 |
| Copper | 2.1E-04 | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Dibenzo(a,h)anthracene | NA | | | NA | | | | | | | | | | | | | 2.1E-04 |
| 1,1-Dichloroethene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| 1,2-Dichloroethene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Fluoranthene | 5.1E-07 | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | NA | | | NA | | | | | | | | | | | | | 5.1E-07 |
| Lithium | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Manganese | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Mercury | 1.2E-04 | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Molybdenum | NA | | | NA | | | | | | | | | | | | | 1.2E-04 |
| Nickel | NA | | | NA | | | | | | | | | | | | | [illegible] |
| Pyrene | 8.2E-07 | | | NA | | | | | | | | | | | | | 0.0E+00 |
| [illegible] | 1.4E-04 | | | NA | | | | | | | | | | | | | 8.2E-07 |
| [illegible] | NA | | | NA | | | | | | | | | | | | | 1.4E-04 |
| Tetrachloroethene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Trichloroethene | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Vanadium | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Zinc | NA | | | 1.6E-03 | | | | | | | | | | | | | 0.0E+00 |
| Americium 241 | NA | | | NA | | | | | | | | | | | | | 1.6E-03 |
| Plutonium 239/240 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Radium 226 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Uranium 233/234 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Uranium 235 | NA | | | NA | | | | | | | | | | | | | 0.0E+00 |
| Uranium 238 | NA | | | NA | | | | | | | | | | | | | [illegible] |
| | HI by pathway | | | | | | | | | | | | | | | | [illegible] |
| | 4.7E-04 | 0.0E+00 | 0.0E+00 | 2.7E-02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 2.7E-02 | | | | | | | | | | | | | | | |

-- = not an applicable pathway
NA = not a COC for this medium or no toxicity factor available

## Table 6-129
## Construction Worker CT Noncarcinogenic HIs for AOC2

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Aluminum | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Antimony | NA | 1 2E-03 | - | | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Aroclor 1254 | NA | NA | - | | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Barium | NA | NA | -- | - | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | NA | | | | | -- | NA | NA | NA | | NA | | | | NA | [illegible] |
| Benzo(a)pyrene | NA | NA | | -- | - | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | NA | -- | -- | -- | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| Beryllium | NA | 1 3E-05 | -- | -- | - | | -- | NA | NA | NA | | NA | | | | NA | 1 3E-05 |
| Cadmium | NA | 1 3E-04 | -- | -- | -- | | | NA | NA | 1 3E-05 | | NA | | | | NA | 1 4E-04 |
| Copper | 4 6E-05 | 1 0E-04 | -- | -- | -- | -- | - | NA | NA | NA | | NA | | | | NA | 1 5E-04 |
| Dibenzo(a,h)anthracene | NA | NA | -- | -- | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| 1,1 Dichloroethene | NA | NA | | | -- | - | - | NA | NA | NA | | NA | | | | NA | [illegible] |
| 1,2-Dichloroethene | NA | NA | -- | | -- | -- | -- | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Fluoranthene | 1 1E-07 | NA | | | -- | | | NA | NA | NA | | NA | | | | NA | 1 1E-07 |
| Indeno(1,2,3-cd)pyrene | NA | NA | -- | -- | -- | -- | | NA | NA | NA | | NA | - | | | NA | 0 0E+00 |
| Lithium | NA | NA | - | -- | -- | - | - | NA | NA | NA | - | NA | | | | NA | 0 0E+00 |
| Manganese | NA | NA | - | -- | | | | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Mercury | 2 7E-05 | NA | - | | - | -- | -- | 4 4E-13 | NA | NA | | NA | | | | NA | 2 7E-05 |
| Molybdenum | NA | 4 4E-04 | | | - | | | NA | NA | NA | | NA | | | | NA | 4 4E-04 |
| Nickel | NA | 1 1E-04 | | | | - | | NA | NA | NA | | NA | | | | NA | 1 1E-04 |
| [illegible] | 1 8E-07 | NA | | | | | | NA | NA | NA | | NA | | | | NA | 1 8E-07 |
| [illegible] | 3 2E-05 | 8 6E-05 | | | | | | NA | NA | NA | | NA | - | | | NA | 1 2E-04 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | - | | NA | 0 0E+00 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | [illegible] |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| [illegible] | NA | NA | | | | | | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| A[illegible] 241 | NA | NA | | | - | | | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Plutonium 239/240 | NA | NA | -- | - | -- | - | - | NA | NA | NA | | NA | | | | NA | 0 0E+00 |
| Radium 226 | NA | NA | -- | -- | -- | | -- | NA | NA | NA | - | NA | - | | | NA | 0 0E+00 |
| Uranium-233/234 | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | - | NA | - | | | NA | 0 0E+00 |
| Uranium 235 | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | -- | NA | | - | | NA | 0 0E+00 |
| Uranium 238 | NA | NA | -- | -- | -- | -- | -- | NA | NA | NA | | NA | -- | | | NA | 0 0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 1 0E-04 | 2.1E-03 | 0 0E+00 | 0.0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 4 4E-13 | 0.0E+00 | 1 3E-05 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | | | | | | | | | | | | | | | | | |
| | Total HI | 2.2E-03 | | | | | | | | | | | | | | | |

-- not an applicable pathway

NA not COC for this medium or no toxicity factor is available

**Table 6-130**
**Current Worker CT Noncarcinogenic HIs for AOC2**

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Aluminum | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Antimony | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Aroclor 1254 | NA | | | | | | | NA | NA | | | | | | | NA | [illegible] |
| Barium | NA | | | | | | | NA | NA | | | | | | | NA | [illegible]0E 00 |
| Benzo(a)anthracene | NA | | | | | | | NA | NA | | | | | | | NA | 0E 00 |
| Benzo(a)pyrene | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Benzo(b)fluoranthene | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Beryllium | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Cadmium | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Copper | 3.5E-05 | | | | | | | NA | NA | | | | | | | NA | 0E+00 |
| Dibenzo(a,h)anthracene | NA | | | | | | | NA | NA | | | | | | | NA | 3.5E-05 |
| 1,1 Dichloroethene | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| 1,2 Dichloroethene | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Fluoranthene | 8.6E-08 | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | NA | | | | | | | NA | NA | | | | | | | NA | 8.6E-08 |
| Lithium | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Manganese | NA | | | | | | | NA | NA | | | | | | | NA | 0E+00 |
| Mercury | 2.1E-05 | | | | | | | 2.1E-12 | NA | | | | | | | NA | 0.0E+00 |
| Molybdenum | NA | | | | | | | NA | NA | | | | | | | NA | 2.1E-05 |
| Nickel | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | 1 E 7 | | | | | | | NA | NA | | | | | | | NA | 0E 00 |
| [illegible] | 2.4E-05 | | | | | | | NA | NA | | | | | | | NA | 1.4E-07 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 2.4E-05 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | N | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| A[illegible] | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Plutonium 239/240 | NA | | | | | | | NA | NA | | | | | | | NA | 0E |
| Radium 226 | NA | | | | | | | NA | NA | | | | | | | NA | [illegible]0E 00 |
| Uranium 233/234 | NA | | | | | | | NA | NA | | | | | | | NA | 0E 00 |
| Uranium 235 | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| Uranium 238 | NA | | | | | | | NA | NA | | | | | | | NA | 0.0E+00 |
| | HI by pathway | | | | | | | | | | | | | | | NA | 0.0E+00 |
| | 8.0E-05 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 2.1E-12 | 0.0E+00 | 0.0E+00 | 0.0E 00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 8.0E-05 | | | | | | | | | | | | | | | |

-- not applicable pathway
NA not COC for this medium or no toxicity factor available

Table 6-131
Ecological Worker CT Noncarcinogenic HIs for AOC2

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sed | Dermal Absorption of Seep Sed | Dermal Absorption of Stream Sed | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | - | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Aluminum | NA | | -- | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Antimony | NA | | -- | 4.1E-03 | | | | NA | NA | | | NA | | | | NA | 4.1E-03 |
| Aroclor 1254 | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible] |
| Barium | NA | -- | | NA | | | - | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)anthracene | NA | | -- | NA | | | - | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(a)pyrene | NA | - | | NA | | | - | NA | NA | | | NA | | | | NA | [illegible] |
| Benzo(b)fluoranthene | NA | | -- | NA | - | | | NA | NA | | | NA | | | | NA | [illegible] |
| Beryllium | NA | | -- | 1.1E-05 | -- | | | NA | NA | | | NA | | | | NA | 1.1E-05 |
| Cadmium | NA | - | - | NA | -- | | -- | NA | NA | | | NA | | | | NA | [illegible] |
| Copper | 3.4E-05 | -- | - | NA | -- | - | -- | NA | NA | - | | NA | | | | NA | 3.4E-05 |
| Dibenzo(a,h)anthracene | NA | - | -- | NA | -- | -- | -- | NA | NA | - | | NA | | | | NA | 0.0E[illegible] |
| 1,1-Dichloroethene | NA | -- | | NA | | -- | | NA | NA | -- | | NA | | | | NA | 0.0E[illegible] |
| 1,2-Dichloroethene | NA | -- | -- | NA | - | -- | - | NA | NA | | | NA | | | | NA | 0.0E[illegible] |
| Fluoranthene | 8.4E-08 | | | NA | -- | - | | NA | NA | | | NA | | | | NA | 8.4E-08 |
| Indeno(1,2,3-cd)pyrene | NA | -- | | NA | -- | - | | NA | | | | NA | | | | NA | 0.0E[illegible] |
| Lithium | NA | | | NA | | - | | NA | NA | | | NA | | | | NA | 0.0E[illegible] |
| Manganese | NA | -- | | NA | - | -- | -- | NA | NA | | - | NA | | | | NA | 0.0E+00 |
| Mercury | 2.0E-05 | -- | | NA | -- | - | | 6.2E-13 | NA | | | NA | | | | NA | 2.0E-05 |
| Molybdenum | NA | | | NA | | | | NA | NA | -- | | NA | | | | NA | 0.0E+00 |
| Nickel | NA | | | NA | - | - | -- | NA | NA | - | | NA | | | | NA | 0.0E+00 |
| Py[illegible] | 1.3E-07 | | | NA | | | | NA | NA | | | NA | | | | NA | 1.3E-07 |
| S[illegible] | 2.4E-05 | | | NA | | | | NA | NA | | | NA | | | | NA | 2.4E-05 |
| S[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | [illegible]E+00 |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E[illegible] |
| T[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E[illegible] |
| V[illegible] | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0.0E[illegible] |
| Zinc | NA | | | 2.6E-04 | | | | NA | NA | | | NA | - | | | NA | 2.6E-04 |
| Americium 241 | NA | | | NA | -- | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Plutonium 239/240 | NA | -- | -- | NA | -- | -- | - | NA | NA | - | | NA | | | | NA | 0.0E+00 |
| Radium 226 | NA | -- | -- | NA | -- | -- | - | NA | NA | -- | | NA | | | | NA | 0.0E+00 |
| Uranium 233/234 | NA | -- | - | NA | -- | -- | -- | NA | NA | -- | - | NA | - | | | NA | 0.0E+00 |
| Uranium 235 | NA | -- | - | NA | -- | - | -- | NA | NA | -- | - | NA | -- | | | NA | 0.0E+00 |
| Uranium 238 | NA | -- | | NA | -- | - | -- | NA | NA | -- | | NA | | | | NA | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 7.8E-05 | 0.0E+00 | 0.0E+00 | 4.4E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 6.2E-13 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | | | | | | | | | | | | | | | | | |
| | Total HI | 4.5E-03 | | | | | | | | | | | | | | | |

-- not an applicable pathway

NA not a COC for this medium or no toxicity factor is available

## Table 6-132
## Office Worker CT Noncarcinogenic HIs for AOC2

| | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediments | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI by chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Aluminum | NA | | -- | -- | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Antimony | NA | | -- | - | | -- | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Aroclor 1254 | NA | | - | -- | - | - | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Barium | NA | -- | -- | -- | - | - | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Benzo(a)anthracene | NA | | -- | - | -- | | -- | NA | NA | - | | NA | | | | NA | 0.0E+00 |
| Benzo(a)pyrene | NA | | -- | | -- | - | - | NA | NA | - | - | NA | | | | NA | 0.0E+00 |
| Benzo(b)fluoranthene | NA | | | -- | -- | -- | -- | NA | NA | -- | | NA | | | | NA | 0.0E+00 |
| Beryllium | NA | - | -- | -- | -- | - | -- | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Cadmium | NA | | - | -- | -- | | | NA | NA | - | | NA | | - | | NA | 0.0E+00 |
| Copper | 1.8E-05 | - | - | - | -- | -- | -- | NA | NA | | - | NA | | | | NA | 1.8E-05 |
| Dibenz(a,h)anthracene | NA | | -- | -- | -- | -- | -- | NA | NA | | -- | NA | | | | NA | 0.0E+00 |
| 1,1-Dichloroethene | NA | -- | | -- | -- | -- | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| 1,2-Dichloroethene | NA | -- | - | -- | -- | -- | -- | NA | NA | -- | | NA | | | | NA | 0.0E+00 |
| Fluoranthene | 4.3E-08 | - | -- | -- | -- | - | | NA | NA | | | NA | | | | NA | 4.3E-08 |
| Indeno(1,2,3-cd)pyrene | NA | | | | | - | -- | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Lithium | NA | | | | -- | | | NA | NA | -- | | NA | | | | NA | 0.0E+00 |
| Manganese | NA | - | | | -- | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Mercury | 1.0E-05 | | | | | | | 1.6E-12 | NA | | | NA | | | | NA | 1.0E-05 |
| Molybdenum | NA | | | | -- | -- | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Nickel | NA | | - | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Py[illegible] | 6.9E-08 | | | | | | | NA | NA | | | NA | | | | NA | 6.9E-08 |
| [illegible] | 1.2E-05 | | | | | | | NA | NA | | | NA | | | | NA | 1.2E-05 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | - | NA | | | | NA | 0.0E+00 |
| [illegible] | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Americium-241 | NA | | | | | | | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Plutonium 239/240 | NA | | | - | - | | | NA | NA | | -- | NA | | | | NA | 0.0E+00 |
| Radium 226 | NA | | -- | -- | -- | | | NA | NA | -- | | NA | | | | NA | 0.0E+00 |
| Uranium 233/234 | NA | -- | -- | -- | -- | | | NA | NA | - | - | NA | | | | NA | 0.0E+00 |
| Uranium 235 | NA | -- | | | -- | | - | NA | NA | | | NA | | | | NA | 0.0E+00 |
| Uranium 238 | NA | -- | | -- | | | | NA | NA | - | | NA | | | | NA | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 4.0E-05 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.6E-12 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 4.0E-05 | | | | | | | | | | | | | | | |

-- = not applicable pathway

NA = not COC for this medium or no toxicity factor available

## Table 6 133
## Adult Open Space User CT Noncarcinogenic HIs for AOC2

| I f | I g S f ce S I | I ge t S b f S I | I g t f I d Sed | I ge t Se p S I | I g S re t S I | I g S fac W | I g S W | I h l f A bo P | De mal Abso p f S f S I | Dermal Al so p t S bs fac S I | De l Al s I | D Abs p f Se p S I | D Abso p f S re S I | D Abs f S W | I Abs p f Se I W | F R I | I HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aceto | NA | | | NA | | | | NA | NA | | | NA | | | | | F |
| Al m m | NA | | -- | NA | | | | NA | NA | | | NA | | | | NA | )F |
| A t m y | NA | | | 5 3E-04 | | | | NA | NA | | | NA | | | | NA | 5 H 4 |
| Aroclo 1254 | NA | - | -- | NA | | - | | NA | NA | - | | NA | | | | NA | 01 X |
| Bari m | NA | | | NA | | -- | | NA | NA | | | NA | | | | NA | ) F |
| Benzo( )a h ce | NA | -- | | NA | | - | | NA | NA | - | | NA | | | | NA | 0 F |
| Benzo( )pyre | NA | - | | NA | | -- | - | NA | NA | - | | NA | | | | NA | F |
| Benzo(b)fluor the | NA | -- | -- | NA | -- | | | NA | NA | - | | NA | | | | NA | ) F 0( |
| Berylli m | NA | | -- | 1 5E-06 | -- | | | NA | NA | | | NA | | | | NA | 1 5F 0 |
| C dm m | NA | | - | NA | -- | -- | | NA | NA | | | NA | | | | NA | F 0 |
| Copper | 4 4E-06 | - | -- | NA | -- | -- | - | NA | NA | | | NA | | | | NA | 4 4E 0( |
| Dibenzo( h)a thracene | NA | -- | -- | NA | -- | -- | -- | NA | NA | | | NA | | | | NA | 0 0E 00 |
| 1,1 Dichloroethene | NA | -- | -- | NA | -- | -- | - | NA | NA | | | NA | | | | NA | 0 0E 00 |
| 1,2 Dichloroeth ne | NA | -- | - | NA | -- | -- | | NA | NA | | | NA | | | | NA | 0 0E 0 |
| Fluoranthen | 1 1E-08 | -- | - | NA | -- | -- | | NA | NA | | | NA | | | | NA | 1 1F 08 |
| Indeno(1,2,3-cd)pyrene | NA | | | NA | - | - | -- | NA | NA | | | NA | | | | NA | 0 F X |
| L thi m | NA | - | -- | NA | -- | - | -- | NA | NA | -- | | NA | | | | NA | 0 0E 00 |
| Manganese | NA | -- | - | NA | | - | -- | NA | NA | | | NA | | | | NA | 0 0F 0( |
| Mercury | 2.6E-06 | | - | NA | - | - | | 2.0E-14 | NA | - | | NA | | | | NA | 2 6F 06 |
| Molybde m | NA | | | NA | | | | NA | NA | | | NA | | | | NA | F |
| N k l | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 E 0 |
| Py | 1 7F-08 | | | NA | | | | NA | NA | -- | | NA | | | | NA | 1 7E 08 |
| I | 3 1F 06 | | | NA | | | | NA | NA | | | NA | | | | NA | 3 1E 06 |
| S | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0F |
| T | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0F 0 |
| I r | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0F |
| ad | NA | | | NA | | | | NA | NA | | | NA | | | | NA | 0 0F 00 |
| Z c | NA | | | 3 4E 05 | | | | NA | NA | | | NA | | | | NA | 3 4F-05 |
| Ame l | NA | | | NA | -- | | - | NA | NA | -- | -- | NA | -- | -- | | NA | 0 0E+00 |
| Pl ton m 239/240 | NA | - | -- | NA | -- | - | -- | NA | NA | - | - | NA | | | | NA | 0 0E 0 |
| Radium 226 | NA | -- | - | NA | -- | -- | -- | NA | NA | | -- | NA | -- | | | NA | 0 0F 00 |
| Uranium 233/234 | NA | -- | -- | NA | -- | -- | - | NA | NA | -- | -- | NA | -- | | | NA | 0 0E 00 |
| Urani m 235 | NA | -- | -- | NA | -- | -- | -- | NA | NA | -- | -- | NA | - | | | NA | 0 0E 00 |
| Urani m 238 | NA | -- | | NA | -- | -- | | NA | NA | -- | - | NA | - | - | | NA | 0 0E 00 |
| | | | | | | | | HIs by pathway | | | | | | | | | |
| | 1 0E-05 | 0.0E+00 | 0 0E+00 | 5.7E-04 | 0 0E+00 | 0 0E+00 | 0.0E+00 | 2.0E-14 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | 0 0E+00 | |
| | Total HI. | 5 8E-04 | | | | | | | | | | | | | | | |

-- not an pplicable pathway

NA not COC for this medium r no toxicity factor is ailable

**Table 6-134**
**Child Open Space User CT Noncarcinogenic HIs for AOC2**

| Chemical of | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sed | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface W | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Soil | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface W | Dermal Absorption of Seep W | External Radiation | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | NA | | - | NA | - | | | | -- | | | | | | | | 0 0E+00 |
| Aluminum | NA | | -- | NA | | | | | | - | | | | | | | 0 0E 00 |
| Antimony | NA | - | -- | 5 0E-03 | - | | -- | | -- | -- | | | -- | | | | 5 0E 03 |
| Aroclor 1254 | NA | -- | -- | NA | -- | -- | - | | -- | | | | | | | | 0 0E+00 |
| Barium | NA | -- | -- | NA | -- | -- | -- | -- | -- | - | -- | -- | - | | | | 0 0E 00 |
| Benzo(a)anthracene | NA | -- | -- | NA | - | - | -- | - | -- | - | -- | - | - | | | | 0 0E 00 |
| Benzo(a)pyrene | NA | | -- | NA | -- | | -- | | -- | -- | | | | | | | 0 0E 00 |
| Benzo(b)fluoranthene | NA | - | -- | NA | -- | | - | | | | | | | | | | 1 4E 05 |
| Beryllium | NA | | -- | 1 4E-05 | -- | -- | -- | | - | | | | | | | | 0 0E+00 |
| Cadmium | NA | - | -- | NA | -- | -- | -- | | -- | | | | | | -- | | 4 1E-05 |
| Copper | 4 1E-05 | - | - | NA | -- | -- | -- | - | -- | -- | | | | - | | | 0 0E+00 |
| Dibenzo(a,h)anthracene | NA | - | -- | NA | -- | -- | -- | -- | -- | - | | | - | -- | | | 0 0E+00 |
| 1,1 Dichloroethene | NA | -- | -- | NA | -- | -- | - | | -- | -- | - | | | | | | 0 0E+00 |
| 1,2 Dichloroethene | NA | -- | -- | NA | -- | -- | -- | -- | -- | -- | | - | | | | | 1 0E-07 |
| Fluoranthene | 1 0E-07 | -- | - | NA | -- | -- | -- | - | -- | | | | | | | | 0 0E+00 |
| Indeno(1,2,3-cd)pyrene | NA | -- | - | NA | -- | -- | -- | -- | -- | | | | | | | | 0 0E 00 |
| Lithium | NA | - | -- | NA | -- | -- | - | | -- | | | | | - | | | 0 0E+00 |
| Manganese | NA | | -- | NA | -- | -- | - | -- | | | | | | | | | 2 4E 05 |
| Mercury | 2 4E-05 | | - | NA | -- | -- | | | -- | | | | | | | | 0 0E+00 |
| Molybdenum | NA | | -- | NA | -- | -- | - | | -- | | - | | -- | | | | 0 0E 00 |
| Nickel | NA | | | NA | - | | | | | | | | | | | | 1 6E-07 |
| Py | 1 6E-07 | | | NA | -- | | -- | | - | | | | | | | | 2 9E 05 |
| [illegible] | 2 3E 05 | | | NA | | | | | | | | | | | | | 0 0E+00 |
| [illegible] | NA | | | NA | | - | | | | | | | | | | | 0 0E 00 |
| T[illegible] | NA | | | NA | | | | | | | | | - | | | | 0 0E+00 |
| [illegible] | NA | | | NA | | | | | | | | | - | | | | 0 0E+00 |
| [illegible] | NA | | | NA | | | | | | | | | | | | | 3 2E-04 |
| Z[illegible] | NA | | | 3 2E 04 | | | | | | | | | - | | | | 0 0E+00 |
| Am[illegible] 241 | NA | | | NA | -- | | | | - | | | | | | | | 0 0E+00 |
| Plutonium 239/240 | NA | - | | NA | -- | -- | | | -- | | | | - | | | | 0 0E+00 |
| Radium 226 | NA | -- | - | NA | -- | - | | - | -- | - | - | | | | | | 0 0E 00 |
| Uranium 233/234 | NA | | - | NA | -- | | - | -- | -- | -- | | | -- | -- | | | 0 0E 00 |
| Uranium 235 | NA | | -- | NA | - | -- | | | -- | | - | | -- | | | | 0 0E 00 |
| Uranium 238 | NA | -- | | NA | -- | -- | - | | | -- | | | - | | | | |
| | HI by pathway | | | | | | | | | | | | | | | | |
| | 9 5E-05 | 0 0E+00 | 0 0E+00 | 5 3E-03 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | Total HI | 5 4E-03 | | | | | | | | | | | | | | | |

-- no applicable pathway

NA not COC for this medium or no toxicity factor available

**Table 6-135**

**Ecological Worker RME Noncarcinogenic HI's for AOC3**

| Ch l f C nce | Inge f S face So l | I ge ti f S bs f ce So l | I ge ti f P d Sedim s | I g ti f Se p Sed m | I ge f S re m Sed | Ing f S f e W e | I g f Se p W | I hal f Ai born P l te | Dermal Abso p f S rf ce So l | Dermal Abso p f S bsu f So l | Dermal Abso pt f P d Sedim | De mal Abso p io f Se p Sed m | D nal Abso p o f S re i Sed | D m l Abso p f S f W | De l Abso p f Se p W | Exte al Rad Expo ure | I l HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | - | NA | -- | NA | NA | | - | | | NA | | NA | NA | | NA | 0 F 00 |
| Al m m | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | F |
| A t mo y | | -- | NA | | NA | NA | | | | | NA | | NA | NA | | NA | F |
| Aroclo 1254 | | | NA | - | NA | NA | - | | | | NA | | NA | NA | | NA | F |
| Bari m | | -- | NA | - | NA | 3.5E-05 | | | | | NA | | NA | NA | | NA | F X |
| Benzo( )a thra e | | | NA | | NA | NA | -- | | | | NA | | NA | NA | | NA | 3 5E |
| Benzo( )pyre | | - | NA | - | NA | NA | | | | | NA | | NA | NA | | NA | E |
| Benzo(b)fl he | | | NA | | NA | NA | - | -- | - | - | NA | | NA | NA | -- | NA | 0 F |
| Berylli n | | | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | F |
| Cadm m | | | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | F |
| Copper | | -- | NA | -- | 1 5E-03 | NA | | -- | | | NA | | NA | NA | | NA | 0 E |
| Dibenzo( h) thracene | -- | -- | NA | -- | NA | NA | -- | | | | NA | | NA | NA | | NA | 1 5E 03 |
| 1 1 Dichloroethene | | | NA | -- | NA | NA | - | | -- | | NA | | NA | NA | | NA | 0 0E 00 |
| 1 2-Dichloroethen | | -- | NA | -- | NA | NA | - | -- | | | NA | | NA | NA | | NA | 0 0E 00 |
| Fluoranthene | | -- | NA | - | NA | NA | -- | -- | - | | NA | | NA | NA | | NA | 0 0E 00 |
| Indeno(1,2,3-cd)pyrene | | -- | NA | - | NA | NA | - | -- | -- | -- | NA | | NA | NA | | NA | 0 0E 00 |
| Lithi m | | -- | NA | | NA | 2.6E-05 | -- | -- | -- | -- | NA | | NA | NA | | NA | 0 0E 00 |
| Manganese | | -- | NA | -- | NA | NA | | - | | | NA | | NA | NA | | NA | 2 6E 05 |
| M rcury | | | NA | | 2 0E-03 | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| Molybde | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 2 0E 03 |
| N k l | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| Py e | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| S | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| S | | | NA | | NA | 1 2E-05 | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| T | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 1 2E 05 |
| T hl h | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| adi | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| Z | | | NA | | 5 4E-04 | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| Am 241 | | - | NA | | NA | NA | -- | -- | | | NA | | NA | NA | | NA | 5 4E 04 |
| Pl toni m 239/240 | | -- | NA | -- | NA | NA | -- | -- | -- | -- | NA | - | NA | NA | - | NA | 0 0E 00 |
| Radium 226 | | -- | NA | -- | NA | NA | -- | -- | -- | -- | NA | | NA | NA | | NA | 0 0E 00 |
| Uranium 233/234 | | -- | NA | -- | NA | NA | -- | -- | -- | - | NA | | NA | NA | | NA | 0 0E 00 |
| Urani m 235 | -- | -- | NA | | NA | NA | -- | - | -- | -- | NA | | NA | NA | - | NA | 0E 00 |
| Urani m 238 | - | -- | NA | -- | NA | NA | -- | -- | -- | -- | NA | | NA | NA | | NA | 0 0E 00 |
| | HIs by pathway | | | | | | | | | | | | | | | | 0 0E 00 |
| | 0 0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4 0E-03 | 7.3E-05 | 0 0E+00 | 0.0E+00 | 0.0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | | | | | | | | | | | | | | | | | |
| | T tal HI. | 4 0E-03 | | | | | | | | | | | | | | | |

not an pplicable pathway

NA not COC for this medium no toxicity factor is ailable.

## Table 6-136
### Adult Open Space User RME Noncarcinogenic HIs for AOC3

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediments | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediments | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface W | Dermal Absorption of Seep W | External Rad Exposure | Total Risk by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | | NA | — | NA | NA | | | - | | NA | | NA | NA | | NA | 0E 00 |
| Aluminum | | | NA | | NA | NA | | | | | NA | | NA | NA | — — | NA | 0 0E 00 |
| Antimony | - | - | NA | — | NA | NA | | — | | — | NA | | NA | NA | | NA | 0 0E 00 |
| Aroclor 1254 | — | — | NA | — | NA | NA | - | — | — | — | NA | | NA | NA | | NA | 0 0E 00 |
| Barium | — | — | NA | — | NA | 4 3E-05 | — | — | — | — | NA | — | NA | NA | — | NA | 4 3E-05 |
| Benzo(a)anthracene | - | | NA | — | NA | NA | | — | — | — | NA | | NA | NA | - | NA | 0 0E 00 |
| Benzo(a)pyrene | — | — | NA | — | NA | NA | — | — | — | - | NA | | NA | NA | | NA | 0 0E 00 |
| Benzo(b)fluoranthene | - | — | NA | — | NA | NA | — | — | — | | NA | | NA | NA | | NA | 0 0E+00 |
| Beryllium | — | — | NA | — | NA | NA | — | — | - | | NA | | NA | NA | | NA | 0 0E 00 |
| Cadmium | | — | NA | — | NA | NA | — | - | — | — | NA | | NA | NA | | NA | 0 0E+00 |
| Copper | — | | NA | — | 2.6E-04 | NA | — | | — | — | NA | | NA | NA | | NA | 2 6E 04 |
| Dibenzo(a,h)anthracene | | | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | | NA | 0 0E+00 |
| 1 1 Dichloroethene | - | — | NA | — | NA | NA | — | — | - | | NA | | NA | NA | | NA | 0 0E+00 |
| 1,2-Dichloroethene | — | — | NA | — | NA | NA | — | — | — | - | NA | - | NA | NA | | NA | 0 0E+00 |
| Fluoranthene | — | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | | NA | 0 0E+00 |
| Indeno(1,2,3-cd)pyrene | | — | NA | — | NA | NA | — | — | — | - | NA | - | NA | NA | | NA | 0 0E 00 |
| Lithium | | — | NA | - | NA | 3.3E-05 | — | - | — | - | NA | | NA | NA | | NA | 3 3E 05 |
| Manganese | | — | NA | — | NA | NA | — | | — | - | NA | | NA | NA | | NA | 0 0E 00 |
| M rcury | - | — | NA | — | 3.6E-04 | NA | — | | — | — | NA | - | NA | NA | | NA | 3 6E-04 |
| Molybde m | | - | NA | — | NA | NA | | - | — | — | NA | | NA | NA | | NA | 0 0E+00 |
| N kel | | — | NA | | NA | NA | | — | — | — | NA | | NA | NA | | NA | 0 0E 00 |
| Py e e | | | NA | | NA | NA | - | | | — | NA | — | NA | NA | | NA | 0 0E 00 |
| S | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E+00 |
| . | — | | NA | | NA | 1 5E-05 | | | | | NA | | NA | NA | | NA | 1 5E-05 |
| T e | | - | NA | | NA | NA | — | | | | NA | | NA | NA | | NA | 0 0E+00 |
| T hi e he e | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| ads m | | | NA | | NA | NA | | | | | NA | - | NA | NA | | NA | 0 0E+00 |
| Z | | | NA | | 9 8E-05 | NA | | | - | - | NA | | NA | NA | | NA | 9 8E 05 |
| Ame i 241 | | | NA | — | NA | NA | — | | — | — | NA | | NA | NA | - | NA | 0 0E+00 |
| Pl to m 239/240 | — | — | NA | — | NA | NA | — | — | - | — | NA | | NA | NA | | NA | 0 0E+00 |
| Radium 226 | | — | NA | — | NA | NA | — | — | — | — | NA | — | NA | NA | | NA | 0 0E+00 |
| Uranium 233/234 | — | — | NA | — | NA | NA | — | — | - | - | NA | — | NA | NA | - | NA | 0 0E+00 |
| Uranium 235 | | — | NA | | NA | NA | — | — | - | — | NA | - | NA | NA | | NA | 0 0E+00 |
| Urani m 238 | | — | NA | - | NA | NA | — | - | — | - | NA | | NA | NA | — | NA | 0 0E+00 |
| | HIs by pathw y | | | | | | | | | | | | | | | | |
| | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 7 2E-04 | 9 1E-05 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E 00 | |
| | Total HI | 8 1E-04 | | | | | | | | | | | | | | | |

— not pplicable pathw y
NA not COC fo thi med um no tox city facto lable

## Table 6-137
**Child Open Space User RME Noncarcinogenic HIs for AOC3**

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediment | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediment | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | | NA | -- | NA | | | | | | | | | | | | [illegible] |
| Aluminum | | | NA | | NA | | | - | | | | | | | | | [illegible] |
| Antimony | | | NA | -- | NA | | | | | | | | | | | | [illegible] |
| Aroclor-1254 | | -- | NA | -- | NA | | | | | | | | | | | | [illegible] |
| Barium | - | - | NA | -- | NA | -- | -- | - | - | - | | | | | | | [illegible] |
| Benzo(a)anthracene | | -- | NA | | NA | | -- | | | | | | | | | | [illegible] |
| Benzo(a)pyrene | | -- | NA | - | NA | -- | | | | | | | | | | | [illegible] |
| Benzo(b)fluoranthene | -- | -- | NA | -- | NA | - | -- | | | -- | | | | | | | [illegible] |
| Beryllium | -- | | NA | - | NA | -- | -- | | | | | | | - | | | [illegible] |
| Cadmium | -- | -- | NA | - | NA | -- | -- | -- | -- | | | - | | | | | 0.0E+00 |
| Copper | -- | | NA | -- | 2.5E-03 | -- | - | | | -- | | | | | | | 0.0E+00 |
| Dibenz(a,h)anthracene | | -- | NA | -- | NA | -- | -- | - | - | -- | - | | | | | | 2.5E-03 |
| 1,1-Dichloroethene | -- | | NA | -- | NA | -- | -- | -- | -- | | - | | | | | | 0.0E+00 |
| 1,2-Dichloroethene | - | - | NA | - | NA | -- | | -- | -- | | - | | | | | | 0.0E+00 |
| Fluoranthene | | -- | NA | - | NA | -- | | - | -- | -- | -- | - | | | | | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | | -- | NA | -- | NA | -- | -- | - | -- | -- | | | | - | | | 0.0E+00 |
| Lithium | | - | NA | -- | NA | -- | | - | - | | | | | | | | 0.0E+00 |
| Manganese | | | NA | -- | NA | -- | | -- | - | -- | | | - | | | | 0.0E+00 |
| Mercury | -- | -- | NA | - | 3.3E-03 | - | | -- | -- | -- | | | | | | | 0.0E+00 |
| Molybdenum | | | NA | | NA | -- | | | | | | | -- | | | | 3.3E-03 |
| Nickel | | | NA | | NA | | | - | | | | | -- | | | | 0.0E+00 |
| Pyrene | | | NA | | NA | | | | - | | | | | | | | 0.0E+00 |
| [illegible] | | | NA | | NA | | - | | | | -- | - | - | | | | 0.0E+00 |
| [illegible] | | | NA | | NA | | | - | -- | -- | | - | - | | | | 0.0E+00 |
| Thallium | | | NA | | NA | | - | | | - | | | - | | | | 0.0E+00 |
| [illegible] | | | NA | | NA | - | | | | | - | | | | | | 0.0E+00 |
| Vanadium | | | NA | | NA | - | | | -- | | | - | | | | | 0.0E+00 |
| Zinc | | | NA | | 9.1E-04 | -- | - | | -- | | | | | | | | 0.0E+00 |
| Americium-241 | | | NA | - | NA | -- | | -- | | | - | | - | - | | | 9.1E-04 |
| Plutonium-239/240 | - | -- | NA | -- | NA | -- | | -- | -- | - | | | - | -- | | | 0.0E+00 |
| Radium-226 | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | | | - | -- | | | 0.0E+00 |
| Uranium-233/234 | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | - | | -- | -- | | - | 0.0E+00 |
| Uranium-235 | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | -- | - | - | | | 0.0E+00 |
| Uranium-238 | -- | - | NA | -- | NA | -- | -- | -- | - | -- | -- | | -- | | | | 0.0E+00 |
| HIs by pathway | | | | | | | | | | | | | | | | | 0.0E+00 |
| | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 6.7E-03 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| Total HI | 6.7E-03 | | | | | | | | | | | | | | | | |

-- not an applicable pathway
NA not COC for this medium or no toxicity factor is available

## Table 6-138
## Ecological Worker CT Noncarcinogenic HIs for AOC3

| Chemicals f Concern | Ingestio f Surface Soil | Ingestio f Subs rface So l | Ingestio of Pond Sediments | Ingestio f Seep Sediments | Ingestio f Stream Sedime ts | Ingestion of S rface W te | Ingestio of Seep W te | Inhalatio of A rborne P rtic lates | Dermal Absorptio of Surface Soil | Dermal Absorptio f Subsurface Soil | Dermal Absorptio f Pond Sedim | Dermal Absorptio f Seep Sediments | Dermal Absorptio f Stre m Sedime | Dermal Absorp io f Surface W te | Dermal Abso ptio of Se p W | Exter al Radiati Exposure | T tal HI by h m al |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | -- | -- | NA | -- | NA | NA | -- | - | -- | - | NA | -- | NA | NA | - | NA | 0 0E+00 |
| Aluminum | -- | | NA | - | NA | NA | - | - | -- | - | NA | -- | NA | NA | - | NA | 0 0E+00 |
| Antimony | - | -- | NA | -- | NA | NA | - | - | - | - | NA | | NA | NA | - | NA | 0 0E 00 |
| Aroclor-1254 | -- | -- | NA | -- | NA | NA | | - | | -- | NA | - | NA | NA | -- | NA | 0 0E+00 |
| Barium | -- | | NA | -- | NA | 2.0E-05 | -- | -- | -- | | NA | - | NA | NA | | NA | 2 0E-05 |
| Benzo(a)anthracene | -- | -- | NA | - | NA | NA | | -- | -- | - | NA | -- | NA | NA | - | NA | 0 0E+00 |
| Benzo(a)pyrene | - | - | NA | -- | NA | NA | -- | -- | -- | - | NA | -- | NA | NA | | NA | 0 0E+00 |
| Benzo(b)fluoranthene | -- | -- | NA | -- | NA | NA | -- | -- | -- | - | NA | - | NA | NA | | NA | 0 0E+00 |
| Beryllium | - | -- | NA | -- | NA | NA | -- | | - | | NA | | NA | NA | | NA | 0 0E 00 |
| Cadmium | - | | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| Copper | | | NA | -- | 4 1E-04 | NA | | - | - | | NA | - | NA | NA | -- | NA | 4 1E 04 |
| Dibenzo(a,h)anthracene | -- | -- | NA | -- | NA | NA | -- | - | | | NA | | NA | NA | | NA | 0 0E 00 |
| 1,1 Dichloroethene | -- | -- | NA | -- | NA | NA | -- | - | | - | NA | | NA | NA | | NA | 0 0E+00 |
| 1,2-Dichloroethene | - | -- | NA | -- | NA | NA | - | -- | -- | - | NA | | NA | NA | | NA | 0 0E+00 |
| Fluoranthene | | | NA | - | NA | NA | | -- | | | NA | | NA | NA | | NA | 0 0E+00 |
| Indeno(1,2,3-cd)pyrene | -- | -- | NA | -- | NA | NA | -- | -- | - | - | NA | -- | NA | NA | | NA | 0 0E+00 |
| Lithium | -- | -- | NA | -- | NA | 1 5E-05 | - | -- | | | NA | - | NA | NA | | NA | 1 5E-05 |
| Manganese | -- | -- | NA | -- | NA | NA | -- | -- | -- | -- | NA | -- | NA | NA | | NA | 0.0E+00 |
| Mercury | -- | -- | NA | -- | 5.5E-04 | NA | - | -- | | | NA | | NA | NA | | NA | 5 5E-04 |
| Molybde m | | -- | NA | | NA | NA | | | - | | NA | | NA | NA | | NA | 0 0E+00 |
| Ni kel | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0 0E 00 |
| Pyrene | | | NA | | NA | NA | | -- | | -- | NA | | NA | NA | | NA | 0 0E+00 |
| Si [illegible] | | | NA | | NA | NA | | | | - | NA | | NA | NA | | NA | 0 0E+00 |
| S[illegible] | | | NA | | NA | 7 0E-06 | | | -- | - | NA | | NA | NA | | NA | 7 0E-06 |
| T archlo e he e | | | NA | | NA | NA | | | -- | - | NA | | NA | NA | | NA | 0 0E+00 |
| T hlor he e | | - | NA | | NA | NA | | | | | NA | - | NA | NA | | NA | 0 0E 00 |
| V adi m | | | NA | | NA | NA | | | -- | | NA | | NA | NA | | NA | 0 0E 00 |
| Z [illegible] | | | NA | - | 1 5E-04 | NA | | | -- | | NA | -- | NA | NA | | NA | 1 5E-04 |
| Americ um 241 | | | NA | | NA | NA | - | | -- | | NA | | NA | NA | - | NA | [illegible]E+00 |
| Pl ton m 239/240 | | | NA | | NA | NA | | -- | -- | - | NA | -- | NA | NA | | NA | 0 0E 00 |
| Radium 226 | | -- | NA | | NA | NA | -- | -- | -- | -- | NA | -- | NA | NA | | NA | 0 0E+00 |
| Uranium-233/234 | -- | -- | NA | -- | NA | NA | -- | -- | -- | - | NA | - | NA | NA | | NA | 0 0E+00 |
| Uranium 235 | -- | -- | NA | -- | NA | NA | -- | -- | -- | -- | NA | | NA | NA | | NA | 0 0E+00 |
| Uranium 238 | -- | -- | NA | -- | NA | NA | | -- | -- | -- | NA | -- | NA | NA | - | NA | 0 0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 0 0E+00 | 0 0E+00 | 0.0E+00 | 0 0E+00 | 1 1E-03 | 4 2E-05 | 0 0E+00 | 0 0E+00 | 0.0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | 0 0E+00 | |
| | Total HI | 1.2E-03 | | | | | | | | | | | | | | | |

-- not pplicable pathway

NA not COC fo thi medi m no tox c ty facto ailable

## Table 6-139
## Adult Open Space User CT Noncarcinogenic HIs for AOC3

| Chemical of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sed | Ingestion of Seep Sediment | Ingestion of Stream Sediment | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulates | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sed | Dermal Absorption of Seep Sed | Dermal Absorption of Stream Sediment | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Rad Exp | Total HI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | [illegible] |
| Aluminum | | | NA | -- | NA | NA | | | -- | | NA | | NA | NA | | NA | [illegible] |
| Antimony | | | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | [illegible] |
| Aroclor 1254 | | | NA | -- | NA | NA | | -- | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Barium | -- | | NA | -- | NA | 7.2E-06 | | | | | NA | | NA | NA | | NA | 7.2E-06 |
| Benzo(a)anthracene | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | [illegible] |
| Benzo(a)pyrene | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | [illegible] |
| Benzo(b)fluoranthene | | -- | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | 0.0E+00 |
| Beryllium | -- | | NA | -- | NA | NA | | | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Cadmium | | | NA | -- | NA | NA | | -- | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Copper | -- | | NA | -- | 5.3E-05 | NA | | | -- | | NA | | NA | NA | | NA | 5.3E-05 |
| Dibenzo(a,h)anthracene | -- | -- | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | 0.0E+00 |
| 1,1-Dichloroethene | -- | | NA | -- | NA | NA | | | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| 1,2-Dichloroethene | | -- | NA | -- | NA | NA | -- | -- | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Fluoranthene | -- | -- | NA | -- | NA | NA | | | | | NA | | NA | NA | | NA | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | -- | | NA | -- | NA | NA | | -- | | | NA | | NA | NA | | NA | 0.0E+00 |
| Lithium | | -- | NA | -- | NA | 5.4E-06 | -- | | -- | | NA | | NA | NA | | NA | 5.4E-06 |
| Manganese | | -- | NA | -- | NA | NA | -- | -- | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Mercury | | | NA | | 7.2E-05 | NA | | | | | NA | | NA | NA | | NA | 7.2E-05 |
| Molybdenum | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0.0E+00 |
| Nickel | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | [illegible] |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | [illegible] |
| [illegible] | | | NA | | NA | NA | | | | | NA | | NA | NA | | NA | [illegible] |
| [illegible] | -- | -- | NA | -- | NA | 2.5E-06 | | | | | NA | | NA | NA | | NA | 2.5E-06 |
| [illegible] | | -- | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0.0E+00 |
| [illegible] | -- | -- | NA | | NA | NA | | | | | NA | | NA | NA | | NA | 0.0E+00 |
| [illegible] | -- | -- | NA | | NA | NA | | | | | NA | -- | NA | NA | | NA | 0.0E+00 |
| [illegible] | -- | -- | NA | | 2.0E-05 | NA | | | | | NA | | NA | NA | | NA | 2.0E-05 |
| Americium | | | NA | | NA | NA | | | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Plutonium 239/240 | | -- | NA | | NA | NA | -- | | -- | -- | NA | | NA | NA | | NA | 0.0E+00 |
| Radium 226 | | | NA | -- | NA | NA | -- | | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Uranium 233/234 | | -- | NA | -- | NA | NA | | | -- | | NA | | NA | NA | | NA | 0.0E+00 |
| Uranium-235 | -- | -- | NA | -- | NA | NA | -- | -- | -- | -- | NA | | NA | NA | | NA | 0.0E+00 |
| Uranium-238 | -- | -- | NA | -- | NA | NA | -- | | -- | -- | NA | -- | NA | NA | | NA | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.4E-04 | 1.5E-05 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | Total HI | 1.6E-04 | | | | | | | | | | | | | | | |

-- Not applicable pathway

NA = not COC for this medium or no toxicity factor available.

## Table 6-140
## Child Open Space User CT Noncarcinogenic Risk Factors for AOC3

| Chemicals of Concern | Ingestion of Surface Soil | Ingestion of Subsurface Soil | Ingestion of Pond Sediments | Ingestion of Seep Sediment | Ingestion of Stream Sediments | Ingestion of Surface Water | Ingestion of Seep Water | Inhalation of Airborne Particulate | Dermal Absorption of Surface Soil | Dermal Absorption of Subsurface Soil | Dermal Absorption of Pond Sediments | Dermal Absorption of Seep Sediment | Dermal Absorption of Stream Sediments | Dermal Absorption of Surface Water | Dermal Absorption of Seep Water | External Radiation Exposure | Total HI by Chemical |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | | | 0.0E+00 |
| Aluminum | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | 0.0E+00 |
| Antimony | | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | | | | | | 0.0E+00 |
| Aroclor-1254 | -- | | NA | -- | NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | 0.0E+00 |
| Barium | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | -- | -- | -- | | | 0.0E+00 |
| Benzo(a)anthracene | -- | -- | NA | -- | NA | -- | -- | | -- | -- | -- | -- | -- | -- | -- | -- | 0.0E+00 |
| Benzo(a)pyrene | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | | | -- | | | -- | 0.0E+00 |
| Benzo(b)fluoranthene | | -- | NA | -- | NA | -- | -- | -- | | -- | -- | -- | | | | | 0.0E+00 |
| Beryllium | -- | -- | NA | -- | NA | -- | -- | | -- | | -- | | | | | | 0.0E+00 |
| Cadmium | | -- | NA | -- | NA | -- | -- | | -- | | | | | | -- | | 0.0E+00 |
| Copper | -- | -- | NA | -- | 1.4E-04 | -- | -- | -- | -- | | -- | | | | | | 1.4E-04 |
| Dibenzo(a,h)anthracene | | -- | NA | -- | NA | -- | | | | | | | | | | | 0.0E+00 |
| 1,1-Dichloroethene | | | NA | -- | NA | -- | -- | -- | | | | | | | | | 0.0E+00 |
| 1,2-Dichloroethene | | | NA | | NA | -- | -- | | | -- | | | | | | | 0.0E+00 |
| Fluoranthene | | | NA | | NA | | | | | | -- | -- | -- | -- | -- | -- | 0.0E+00 |
| Indeno(1,2,3-cd)pyrene | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | | | | | | 0.0E+00 |
| Lithium | -- | | NA | -- | NA | -- | -- | -- | -- | -- | -- | | -- | | | | 0.0E+00 |
| Manganese | | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | | | | | -- | 0.0E+00 |
| Mercury | | -- | NA | -- | 1.9E-04 | -- | | | | | | | | | | | 1.9E-04 |
| Molybdenum | | | NA | | NA | | | -- | -- | | | | | | | | 0.0E+00 |
| Nickel | | | NA | | NA | | | | | | | | | | | -- | 0.0E+00 |
| Pyrene | | | NA | | NA | | -- | | -- | | -- | | -- | | | | 0.0E+00 |
| [illegible] | | | NA | | NA | | | | | | -- | | | | | | 0.0E+00 |
| [illegible] | | | NA | | NA | | | | | | | | | | | | 0.0E+00 |
| [illegible] | | | NA | | NA | | | | | -- | | | -- | | | | 0.0E+00 |
| [illegible] | | | NA | | NA | | | | | | | | | | | | 0.0E+00 |
| Vanadium | | | NA | | NA | | | | -- | | | | -- | | -- | | 0.0E+00 |
| Zinc | | | NA | | 5.2E-06 | -- | -- | | -- | | | | -- | | | -- | 5.2E-06 |
| Americium 241 | | -- | NA | | NA | -- | -- | -- | -- | -- | -- | | -- | | | | 0.0E+00 |
| Plutonium 239/240 | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | | | -- | | | | 0.0E+00 |
| Radium 226 | -- | | NA | -- | NA | -- | -- | -- | -- | -- | -- | | -- | -- | | | 0.0E+00 |
| Uranium 233/234 | -- | -- | NA | -- | NA | -- | -- | -- | -- | | -- | | -- | -- | -- | -- | 0.0E+00 |
| Uranium 235 | -- | -- | NA | | NA | -- | -- | -- | -- | | -- | | -- | | | | 0.0E+00 |
| Uranium 238 | -- | -- | NA | -- | NA | -- | -- | -- | -- | -- | -- | -- | | | -- | | 0.0E+00 |
| | HIs by pathway | | | | | | | | | | | | | | | | |
| | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.8E-04 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | |
| | | | | | | | | | | | | | | | | | |
| | Total HI | 3.8E-04 | | | | | | | | | | | | | | | |

-- = not applicable pathway
NA = no COC for this media or no toxicity factors available

## Table 6 141
## HHRA Uncertainty Factors at OU 5

| Uncertainty Factor | Effect of Uncertainty | Comments |
|---|---|---|
| Data Collection and Evaluation | | |
| Use of unvalidated data | May slightly over or underestimate risk. | When available and appropriate unvalidated data was replaced with validated data. Unvalidated data used are consistent with previous measurements and should only slightly affect risk estimates. Subsequent evaluation of the validation results for unvalidated data used in the HHRA indicates that no impacts to the conclusions of the HHRA result (see Section 4 1) |
| Identification and selection of OU 5 PCOCs and COCs | May slightly over or underestimate risk. | Professional judgement was used to analyze and aggregate OU data. However the approved selection process was used and agency meetings were held to minimize uncertainty Additional discussions regarding lead are contained in the text. |
| Selection of source areas and AOCs | May slightly underestimate risk. | Professional judgement was used to analyze and aggregate OU data However the agreed-upon process for selection of source areas and AOCs was used and agency meetings were held to minimize uncertainty Six source areas were identified resulting in three AOCs. |
| Arsenic was not considered a PCOC in groundwater pond sediments and stream sediments. | May slightly underestimate risk. | Background comparison and professional judgement was applied to eliminate arsenic from these media. An agency meeting was held specifically for this issue and all three agencies agreed to this approach. |
| Pond sediment data collection. | May slightly underestimate risk. | Calculations of inhalation intake of pond sediment used data from the inlet and midpoint sampling locations but not from the deep sampling location This approach was agreed to by the agencies and is not expected to significantly affect inhalation risk. |

## Table 6 141 (Continued)

| Uncertainty Factor | Effect of Uncertainty | Comments |
|---|---|---|
| Exposure Assessment | | |
| Exposure scenario assumptions | May over or underestimate risk. | Exposure scenarios are qualitatively evaluated and documented in the OU 5 Exposure Assessment TM |
| Exposure parameter assumptions | May slightly over or underestimate risk. | Site specific RFETS exposure factors were used The values have been reviewed and agreed to by all three agencies and uncertainty is assumed to be low |
| Chemical specific matrix effects | May overestimate risk. | Chemical-specific matrix effects were derived for applicable OU 5 COCs The values are conservative |
| Nickel evaluated as a noncarcinogen only | May underestimate risk. | Based on process knowledge at RFETS nickel subsulfide (carcinogenic form) is not expected to be a contaminant in soils. |
| Dermal exposure | May over or underestimate risk. | Soil adherence factors skin absorption factors, and dermal permeability can introduce potential uncertainty Dermal absorption of metals is expected to be insignificant compared to the ingestion pathway |
| Toxicity Assessment | | |
| Critical toxicity values derived primarily from animal studies. | May over or underestimate risk. | Extrapolation from animal to humans may induce error due to differences in absorption pharmacokinetics, target organs enzymes and population variability |
| Critical toxicity values derived primarily from high doses and OU 5 exposures are at low doses. | May over or underestimate risk. | Assumes a linear extrapolation to low doses OU 5 exposure assumptions are also conservative |
| Critical toxicity values and classification of carcinogens. | May over or underestimate risk. | Not all toxicity values represent the same degree of certainty All are subject to change as new evidence becomes available |

## Table 6-141 (Continued)

| Uncertainty Factor | Effect of Uncertainty | Comments |
|---|---|---|
| Lack of dermal absorption or direct action toxicity values. | May slightly underestimate risk. | The unavailability of consensus absorption values does not facilitate comparison of absorbed dose to toxicity constants based on administered dose Dermal absorption of metals is expected to be insignificant when compared to ingestion Consistent with RAGS dermal absorption of PAHs is not quantitatively evaluated. |
| Risk Characterization | | |
| Use of cancer slope factors | May overestimate risk. | Potencies are upper 95th percentile confidence limits Considered unlikely to underestimate true risk. |
| Lack of toxicological data for some PCOCs | May underestimate risk. | No EPA-established toxicity criteria are provided for benzo(g h i)perylene dibenzofuran lead 2 methylnaphthylene phenanthrene silicon and 1 1 1 trichloroethane |
| Addition of risks across weight-of evidence classifications. | May overestimate risk. | Addition of risks across weight-of evidence classifications is extremely health conservative and potentially even inappropriate |

**Table 6-142**
**Summary of RME Point Estimates of Carcinogenic Risk**

| Receptor/Location | Total Risk | Dominant COC | Dominant Pathway |
|---|---|---|---|
| Future Construction Worker AOC1 | 4E 07 | uranium 238 | Ingestion of surface soil and external radiation |
| Future Construction Worker AOC2 | 8E 08 | uranium 238 | Ingestion of surface soil |
| Current Security Worker AOC1 | 3E 05 | uranium 238 | External radiation |
| Current Security Worker AOC2 | 4E 06 | uranium 238 | External radiation |
| Future Ecological Researcher AOC1 | 1E 06 | uranium 238 | External radiation |
| Future Ecological Researcher AOC2 | 2E 07 | uranium 238 | External radiation |
| Future Ecological Researcher AOC3 | 2E 08 | plutonium 239/240 | Ingestion of pond sediments |
| Future Office Worker AOC1 | 3E 05 | uranium 238 | External radiation |
| Future Office Worker AOC2 | 4E 06 | uranium 238 | External radiation |
| Future Open Space User AOC1 | 4E 06 | uranium 238 | External radiation |
| Future Open Space User AOC2 | 6E 07 | uranium 238 | External radiation |
| Future Open Space User AOC3 | 4E 08 | plutonium 239/240 | Ingestion of pond sediment |

**Table 6-143**
**Summary of RME Point Estimates of Noncarcinogenic Hazard Indices**

| Receptor/Location | Total HI | Dominant COC | Dominant Pathway |
|---|---|---|---|
| Future Construction Worker AOC1 | 4E 02 | Aroclor 1254 | Ingestion of subsurface soil |
| Future Construction Worker AOC2 | 1E 02 | antimony | Ingestion of subsurface soil |
| Current Security Worker AOC1 | 7E 02 | Aroclor 1254 | Dermal absorption of surface soil |
| Current Security Worker AOC2 | 5E 04 | copper | Ingestion of subsurface soil |
| Future Ecological Researcher AOC1 | 4E 02 | Aroclor 1254 | Dermal absorption of surface soil |
| Future Ecological Researcher AOC2 | 2E 02 | antimony | Ingestion of seep sediments |
| Future Ecological Researcher AOC3 | 4E 03 | mercury | Ingestion of stream sediments |
| Future Office Worker AOC1 | 5E 02 | Aroclor 1254 | Dermal absorption of surface soil |
| Future Office Worker AOC2 | 5E 04 | copper | Ingestion of surface soil |
| Future Adult Open Space User AOC1 | 1E 02 | Aroclor 1254 | Dermal absorption of surface soil |
| Future Adult Open Space User AOC2 | 3E 03 | antimony | Ingestion of seep sediments |
| Future Adult Open Space User AOC3 | 8E 04 | mercury | Ingestion of stream sediments |
| Future Child Open Space User AOC1 | 4E 02 | antimony | Ingestion of seep sediments |
| Future Child Open Space User AOC2 | 3E 02 | antimony | Ingestion of seep sediments |
| Future Child Open Space User AOC3 | 7E 03 | mercury | Ingestion of stream sediments |

## Table 6-144
## Effective Dose Conversion Factors for Radionuclides

| Radionuclide | $f_1$[1] | Ingestion DCF (Sv/Bq)[2] | Lung Clearance Class[3] | Inhalation DCF (Sv/Bq)[2] | External DCF (mrem/yr per pCi/ m ) |
|---|---|---|---|---|---|
| Americium 241 | 1 00E 03 | 9 84E 07 | W | 1 20E 04 | 2 99E 02 |
| Plutonium 239[4] | 1 00E 03 | 9 56E 07 | W | 1 16E 04 | 3 78E 04 |
| Uranium 234[5] | 5 00E 02 | 7 66E 08 | W | 2 13E 06 | 8 07E 04 |
| Uranium 235 | 5 00E-02 | 7 19E 08 | W | 1 97E 06 | 1 90E 01 |
| Uranium 238 | 5 00E-02 | 6 88E 08 | W | 1 90E 06 | 2 59E 02 |

[1] Fractional uptake from the small intestine to the blood

[2] To convert to conventional units of mrem/pCi multiply the table entry by 3 7E+03

[3] Lung clearance class W = weeks

[4] Used to evaluate Pu 239/240

[5] Used to evaluate U 233/234

**Table 6-144**
**Effective Dose Conversion Factors for Radionuclides**

| Radionuclide | $f_1$[1] | Ingestion DCF (Sv/Bq)[2] | Lung Clearance Class[3] | Inhalation DCF (Sv/Bq)[2] | External DCF (mrem/yr per pCi/ m) |
|---|---|---|---|---|---|
| Americium 241 | 1 00E 03 | 9 84E 07 | W | 1 20E 04 | 2 99E 02 |
| Plutonium 239[4] | 1 00E 03 | 9 56E 07 | W | 1 16E 04 | 3 78E 04 |
| Uranium 234[5] | 5 00E 02 | 7 66E 08 | W | 2 13E 06 | 8 07E 04 |
| Uranium 235 | 5 00E-02 | 7 19E 08 | W | 1 97E 06 | 1 90E 01 |
| Uranium 238 | 5 00E-02 | 6 88E 08 | W | 1 90E 06 | 2 59E 02 |

[1] Fractional uptake from the small intestine to the blood
[2] To convert to conventional units of mrem/pCi multiply the table entry by 3 7E+03
[3] Lung clearance class W = weeks
[4] Used to evaluate Pu 239/240
[5] Used to evaluate U 233/234

**Table 6 146**
**Summary of Annual Radiation Dose for AOC2**

| Pathway | Annual Radiation Dose Central Tendency (mrem/yr) | Annual Radiation Dose Reasonable Maximum (mrem/yr) |
|---|---|---|
| **Construction Worker** | | |
| Ingestion of surface soil | 1 4E-02 | 7 4E-02 |
| Ingestion of subsurface soil | 9 3E-03 | 4 9E-02 |
| Inhalation of airborne particulates | 1 0E-03 | 1 1E-03 |
| External irradiation from subsurface soil | 7 1E-03 | 8 8E-03 |
| Total | 3 1E-02 | 1 3E-01 |
| **Current Worker** | | |
| Ingestion of surface soil | 1 1E-02 | 6 4E-02 |
| Inhalation of airborne particulates | 4 9E-03 | 5 6E-03 |
| External irradiation from surface soil | 1 6E-02 | 3 0E-02 |
| Total | 3 2E-02 | 9 9E-02 |
| **Ecological Worker** | | |
| Ingestion of surface soil | 4 8E-02 | 3 5E-02 |
| Ingestion of seep sediments | 3 3E-03 | 1 1E-02 |
| Inhalation of airborne particulates | 2 4E-03 | 2 4E-03 |
| External irradiation from surface soil | 8 5E-03 | 1 1E-02 |
| Total | 6 2E-02 | 5 9E-02 |
| **Office Worker** | | |
| Ingestion of surface soil | 5 6E-03 | 6 4E-02 |
| Inhalation of airborne particulates | 3 7E-03 | 5 6E-03 |
| External irradiation from surface soil | 1 6E-02 | 3 0E-02 |
| Total | 2 5E-02 | 9 9E-02 |
| **Open Space Recreational User (adult)** | | |
| Ingestion of surface soil | 1 3E-03 | 6 4E-03 |
| Ingestion of seep sediments | 3 9E-04 | 1 9E-03 |
| Inhalation of airborne particulates | 2.2E-04 | 9 4E-04 |
| External irradiation from surface soil | 1 4E-03 | 3 5E-03 |
| Total | 3 3E-03 | 1.3E-02 |
| **Open Space Recreational User (child)** | | |
| Ingestion of surface soil | 1 3E-03 | 5 5E-02 |
| Ingestion of seep sediments | 3 9E-04 | 2 3E-03 |
| Total | 1 7E-03 | 5 8E-02 |

**Table 6 145**
**Summary of Annual Radiation Dose for AOC1**

| Pathway | Annual Radiation Dose Central Tendency (mrem/yr) | Reasonable Maximum (mrem/yr) |
|---|---|---|
| **Construction Worker** | | |
| Ingestion of surface soil | 6 5E 02 | 3 5E-01 |
| Ingestion of subsurface soil | 2 5E 03 | 1 3E-02 |
| Inhalation of airborne particulates | 2 1E 03 | 2 3E-03 |
| External irradiation from subsurface soil | 1 6E 03 | 2 0E-03 |
| Total | 7 1E 02 | 3 6E 01 |
| **Current Worker** | | |
| Ingestion of surface soil | 5 3E 02 | 3 0E-01 |
| Inhalation of airborne particulates | 1 0E 02 | 1 1E-02 |
| External irradiation from surface soil | 1 2E-01 | 2 3E-01 |
| Total | 1 8E-01 | 5 4E-01 |
| **Ecological Worker** | | |
| Ingestion of surface soil | 1 2E-01 | 1 7E-01 |
| Ingestion of seep sediments | 1 6E-03 | 5 0E-03 |
| Inhalation of airborne particulates | 5 0E-03 | 5 0E-03 |
| External irradiation from surface soil | 6 5E-02 | 8 1E-02 |
| Total | 1 9E-01 | 2 6E 01 |
| **Office Worker** | | |
| Ingestion of surface soil | 2 6E-02 | 3 0E 01 |
| Inhalation of airborne particulates | 7 6E-03 | 1 1E-02 |
| External irradiation from surface soil | 1 2E-01 | 1 1E 02 |
| Total | 1 6E-01 | 3 2E-01 |
| **Open Space Recreational User (adult)** | | |
| Ingestion of surface soil | 6 0E-03 | 3 0E-02 |
| Ingestion of seep sediments | 1 8E-04 | 9 1E-04 |
| Inhalation of airborne particulates | 4 6E-04 | 1 9E-03 |
| External irradiation from surface soil | 1 1E-02 | 2 7E-02 |
| Total | 1 7E-02 | 6 0E-02 |
| **Open Space Recreational User (child)** | | |
| Ingestion of surface soil | 6 0E-03 | 6 0E-02 |
| Ingestion of seep sediments | 1 8E-04 | 1 8E-03 |
| Total | 6 2E 03 | 6 2E-02 |

**Table 6 147**
**Summary of Annual Radiation Dose for AOC3**

| Pathway | Annual Radiation Dose<br>Central Tendency (mrem/yr) | Reasonable Maximum (mrem/yr) |
|---|---|---|
| **Ecological Worker** | | |
| Ingestion of pond sediments | 2 6E-02 | 8 4E-02 |
| Ingestion of stream sediments | 1 4E 02 | 4 6E-02 |
| Ingestion of surface water | 9 6E-05 | 8 2E-04 |
| Total | 4 1E-02 | 1 3E-01 |
| **Open Space Recreational User (adult)** | | |
| Ingestion of pond sediments | 3 1E-03 | 1 5E-02 |
| Ingestion of stream sediments | 1 7E-03 | 8 4E-03 |
| Ingestion of surface water | 1 0E-04 | 1 0E-03 |
| Total | 4 8E-03 | 2 5E-02 |
| **Open Space Recreational User (child)** | | |
| Ingestion of pond sediments | 6 1E-03 | 3 1E-02 |
| Ingestion of stream sediments | 3 4E-03 | 1 7E-02 |
| Ingestion of surface water | 1 7E-04 | 3 4E-04 |
| Total | 9 6E-03 | 4 8E-02 |

**Table 6 146**
**Summary of Annual Radiation Dose for AOC2**

| Pathway | Annual Radiation Dose Central Tendency (mrem/yr) | Reasonable Maximum (mrem/yr) |
|---|---|---|
| **Construction Worker** | | |
| Ingestion of surface soil | 1 4E-02 | 7 4E-02 |
| Ingestion of subsurface soil | 9 3E-03 | 4 9E-02 |
| Inhalation of airborne particulates | 1 0E-03 | 1 1E-03 |
| External irradiation from subsurface soil | 7 1E-03 | 8 8E-03 |
| Total | 3 1E-02 | 1 3E-01 |
| **Current Worker** | | |
| Ingestion of surface soil | 1 1E-02 | 6 4E-02 |
| Inhalation of airborne particulates | 4 9E-03 | 5 6E-03 |
| External irradiation from surface soil | 1 6E-02 | 3 0E-02 |
| Total | 3 2E-02 | 9 9E-02 |
| **Ecological Worker** | | |
| Ingestion of surface soil | 4 8E-02 | 3 5E-02 |
| Ingestion of seep sediments | 3 3E-03 | 1 1E-02 |
| Inhalation of airborne particulates | 2 4E-03 | 2 4E-03 |
| External irradiation from surface soil | 8 5E-03 | 1 1E-02 |
| Total | 6 2E-02 | 5 9E-02 |
| **Office Worker** | | |
| Ingestion of surface soil | 5 6E-03 | 6 4E-02 |
| Inhalation of airborne particulates | 3 7E-03 | 5 6E-03 |
| External irradiation from surface soil | 1 6E-02 | 3 0E-02 |
| Total | 2 5E-02 | 9 9E-02 |
| **Open Space Recreational User (adult)** | | |
| Ingestion of surface soil | 1 3E-03 | 6 4E-03 |
| Ingestion of seep sediments | 3 9E-04 | 1 9E-03 |
| Inhalation of airborne particulates | 2.2E-04 | 9 4E-04 |
| External irradiation from surface soil | 1 4E-03 | 3 5E-03 |
| Total | 3 3E-03 | 1 3E-02 |
| **Open Space Recreational User (child)** | | |
| Ingestion of surface soil | 1 3E-03 | 5 5E 02 |
| Ingestion of seep sediments | 3 9E-04 | 2.3E-03 |
| Total | 1 7E-03 | 5 8E-02 |

# 7 0 ECOLOGICAL RISK ASSESSMENT FOR THE WOMAN CREEK PRIORITY DRAINAGE

The ecological risk assessment (ERA) for the Woman Creek Priority Drainage is summarized in this section ERAs for the Walnut Creek and Woman Creek watersheds were combined and results presented in a single report (Appendix N) The ERAs represent the ecological portions of the baseline risk assessments associated with the RFI/RIs for OUs 1 2 4 (in part) 5 6 7 10 (in part) and 11 ERAs were formerly planned for each OU and preliminary ecological field investigations were conducted on that basis The resulting analyses fulfills the requirements of Attachment 2 Section VIII Interagency Agreement

The combined ERA was conducted based on recent agreements among the EPA CDPHE and DOE The agencies agreed that it is ecologically more appropriate to conduct the ERAs for each watershed This scale is more relevant to ecological receptors because they are not constrained by the administrative boundaries associated with the OUs ERAs are now required for four areas (1) the industrial area/protected area (IA/PA) (2) the Walnut Creek watershed (3) the Woman Creek watershed and (4) offsite areas including Great Western Reservoir Standley Lake and Mower Reservoir The ERA accompanying this report addresses ecological risks from contaminant sources in the Walnut Creek and Woman Creek watersheds with the Site boundaries but outside of the IA/PA

An ERA is required to support the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Record of Decision or the Resource Conservation and Recovery Act (RCRA) Corrective Action Decision for any of the OUs within the areas mentioned above Sections within CERCLA include statements that both human health and the environment must be considered when assessing risks associated with releases from hazardous waste sites Also the National Contingency Plan (NCP) specifically states that an environmental evaluation must be performed to assess threats to the environment (40 CFR Part 300 430 [e][2][i][G]) during the overall process of assessing the need to remediate a hazardous waste site The Interagency Agreement (IAG) negotiated among DOE EPA and CDPHE states that one objective of the

RFI/RI is to provide data to establish the baseline risk assessment for human health and the environment for the OU The methodology used here evaluates the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to one or more chemical stressors (EPA 1992d)

## 7 1 SUMMARY OF ECOLOGICAL RISK ASSESSMENT METHODOLOGY

An ecological risk assessment methodology (ERAM) for the Site was developed to support risk management decisions for individual OUs The approach used is consistent with a screening level risk assessment appropriate for sites where ecological effects have not been observed but contaminant levels have been measured and can be compared with concentrations considered protective of ecological receptors The Site ERAM draws from DOE and EPA guidance and ERA tools developed at Oak Ridge National Laboratory (ORNL) and the Savannah River Site (DOE 1993k 1993b EPA 1992d 1994f Norton *et al* 1992 Opresko *et al* 1994)

The ERAM is documented in three technical memoranda (TMs)

ERA TM1 Assessment Endpoints (in preparation)
ERA TM2 Sitewide Conceptual Model
ERA TM3 Ecological Chemicals of Concern (ECOCs) Screening Methodology

The ERA TM1 is currently in preparation and will provide sitewide guidance on developing assessment endpoints the ecological resources to be protected and the objectives of the assessments Specific assessment endpoints and objectives for the Walnut Creek and Woman Creek ERA are identified in Appendix N Section N4

The ERA TM2 (DOE 1995f) describes ecological components of the site that are potentially affected by contamination and presents baseline assumptions and parameter values used in exposure estimates and risk characterization The following information was included in the ERA TM2

Descriptions of the key ecological features of the Site including vegetation wildlife aquatic organisms and protected species

Summaries of existing sitewide monitoring programs

Exposure pathway models which describe the contaminant transport and exposure mechanisms important in evaluating exposure of ecological receptors to the chemical stressors at the Site

Selection criteria for the identification of key ecological receptors

General exposure parameters for key receptor species

The ERA TM3 (DOE 1995g) describes a phased approach to identify ECOCs the environmental contaminants that are the focus of risk characterization Tier 1 screening consisted of identifying contaminants within each source area that were detected at levels above background concentrations This was done using a statistical methodology developed specifically for the Site The result of Tier 1 was a list of PCOCs that was further screened in Tier 2 and Tier 3 using ecotoxicity criteria. Tier 2 and Tier 3 screens each required estimates of exposure for the key ecological receptors at the Site Methods used in Tiers 1 2 and 3 screening are explained in detail in Appendix N (Section N3) The watershed ERA focused on identification and characterization of ECOCs because chemical stressors are usually of greatest concern for ERAs conducted as part of CERCLA investigations (EPA 1994f)

## 7 2 PRELIMINARY EXPOSURE AND RISK SCREEN

An initial step in conducting the watershed ERAs was to evaluate contaminant distribution and identify ECOCs This evaluation required screening level exposure and risk estimations using data collected during RFI/RI activities and sitewide environmental monitoring programs The screen corresponds to the preliminary exposure and risk calculation step of the EPA procedure for conducting ERAs at Superfund sites (EPA 1994g)

The purpose of the sitewide ERA is to provide information that is useful for both evaluating ecological risk on a watershed basis and making decisions regarding remedial actions associated with the individual OUs and IHSSs within them. Therefore ecological risks were estimated for distinct subareas of each watershed called ERA source areas which were identified by grouping IHSSs based on OU location and contaminant sources (Figure 7 2 1) Source area boundaries were determined based on abiotic and biotic sampling locations Risks were quantified for each source area separately and their contribution to overall risk in the watershed was determined

The primary objective of the ecotoxicity screen is to evaluate exposures to determine if the chemical concentrations represent an ecotoxicological threat The risk was evaluated by comparing site exposures to toxicity reference values (TRVs) or benchmark exposures that if exceeded could result in adverse effects TRVs were derived to represent the No Observed Adverse Effects Level (NOAEL) for sublethal systemic and reproductive effects The approach to derivation of TRVs is described in TM3 Specific uses of TRVs for the watershed ERAs is presented in Appendix N Section N3 2 6

Assistance in developing TRVs was solicited from other sites in the DOE complex and associated academic institutions Site specific ecotoxicological benchmarks were derived using methods developed at Oak Ridge National Laboratories (ORNL) (Opresko *et al* 1994) Toxicologists from Clemson University and radioecologists from Oregon State University and Argonne National Laboratory conducted extensive literature searches for the remaining PCOCs and developed preliminary benchmarks Life history information on representative species found at the Site was obtained from EPA (1993b) or scientific literature and documented by in the ERA TM2 (DOE 1995f)

Risk was estimated by comparing the site exposures to TRVs using the hazard quotient (HQ) approach (EPA 1994f) The HQ is the ratio of the site exposure versus the TRV (exposure – TRV) The hazard index (HI) is the sum of individual HQs for individual chemicals and was used to approximate cumulative risk in an area (DOE 1995g) TRVs and exposures were based on calculating effects on individual organisms This approach was taken because the most reliable methods for estimating exposure and effects are individual based Extrapolation to populations or communities was qualitative and based on area of affected habitat quality of resources and species specific behaviors

ECOC screens were conducted for three wide ranging species (coyote mule deer and red tailed hawk) and four receptors with more restricted home ranges (limiting species) Risk for wide ranging species was negligible no HQs or HIs were greater than 1 ECOCs were identified for limiting species and aquatic receptors that may spend all or most of their time in small areas and therefore are in more frequent contact with contaminants ECOCs were identified by source area and receptor type and included metals radionuclides and organic compounds (Table 7 1) Cumulative risks were identified based on HIs (Figure 7 2 2)

## 7 3 PROBLEM FORMULATION AND RISK CHARACTERIZATION

The preliminary risk screen identified ECOCs based on chemical concentrations in abiotic and biotic media and conservative assumptions concerning exposure and toxicity The remainder of the ERA focuses on further characterization of ecological risk from exposure to the ECOCs Specific objectives and the approach for risk characterization are described in problem formulation (EPA 1994f)

### 7 3 1 Problem Formulation

The risk characterization has two main goals (1) refine risk estimates through use of less conservative and more realistic assumptions and characterize remaining uncertainty and (2) identify areas chemicals and media contributing to risk Where feasible guidance for developing cleanup criteria protective of assessment endpoints was also provided Where appropriate exposures and risk were summarized by watershed OU and IHSS to aid in risk management and remediation decisions

Conservative assumptions were used in the Tier 3 screen to improve efficiency of the screen or to account for uncertainty in exposure or toxicity estimates Conservative assumptions were selected to minimize the probability of underestimating risk so that uncertainty would be biased in only one direction (EPA 1994f) Refinement of risk estimates involved use of less conservative assumptions and/or site data on direct measurement of toxic effects to reduce uncertainty In most cases a combination of data types was used in a weight of evidence approach to risk characterization

The risk characterization for each of the ECOCs included the following activities (1) refine exposure estimates to more accurately reflect site conditions including bioavailability contaminant distribution and frequency and duration of exposures (2) refine toxicity estimates based on more specific evaluation of contaminant forms and potential toxicity (3) review site data to determine if predicted effects were manifested (4) if appropriate extrapolate effects on individuals to estimate effects to the Site populations or communities and (5) identify characterize and rank sources of uncertainty and identify data needed to further refine estimates

The risk characterization focused on the potential toxic effects of ECOCs on five ecological receptor groups

1 Aquatic life
2 Aquatic feeding birds
3 Terrestrial feeding raptors

4 Small mammals

5 Vegetation communities

These receptor groups were selected based on results of the ECOC screen presented in Appendix N Section N3 either because potential toxicity from ECOCs was identified or because available data were inadequate to conclude that risk was negligible

Assessment endpoints and specific objectives of the risk characterization were identified for each resource category and presented in Appendix N Table N4 1 Assessment endpoints are explicit expressions of the environmental values to be protected (Suter 1989 and EPA 1992d) The purpose of assessment endpoints in this phase of the watershed ERAs was to focus the risk characterization on potential exposures to ECOCs and the specific effects that may result The potential for exposure and toxicity was established in the Tier 3 screen In most cases the specific effect is defined by the toxicological endpoints on which the TRVs were based Most of these endpoints were based on chronic sublethal or reproductive effects that were not measured at the Site Results of toxicity testing or other measurements of effects were available for some groups and were used where appropriate

For each receptor group assessment endpoints exposure pathways and specific goals and objectives are identified and described in Appendix N Section N4 Where appropriate a working null hypothesis ($H_0$) was defined to help guide analysis and evaluation of uncertainty

### 7 3 2 Risk Characterization

The risk characterization was completed using qualitative and quantitative approaches described in the problem formulation step In some cases the evaluation focused on assessing the adequacy of data used in exposure calculations In other cases more accurate or quantitative methods were used to estimate frequency or duration of exposures

Specific measurements of metals radionuclides and PCBs in biota were available for evaluating exposures and food web transfers These data were reliable indicators of exposure (Suter 1993) and were also used to evaluate potential impacts to upper level consumers from ECOCs accumulated in forage or prey However for other ECOCs the risk characterization was largely conducted without the benefit of sampling and analysis specifically designed to evaluate effects of ECOCs Results of risk characterization are detailed in Appendix N and summarized in the following subsections Analyses of potential effects on aquatic life for the watersheds were combined Evaluation of effects on terrestrial biota are discussed for the Woman Creek watershed Risks are summarized by receptor group ECOC and ERA source areas in Table 7 2

### 7 3 2 1 Summary of Risks to Aquatic Life

The preliminary risk screen was based on comparisons of chemical concentrations in sediments and surface water to TRVs derived from the literature or calculated using methods recommended by EPA (EPA 1992d) The screen identified several ECOCs in sediments but none for surface water Sediment ECOCs included volatile and semivolatile organics PCBs and metals

The magnitude of sediment HQ and HI values for some sites in Walnut Creek suggested a high level of toxicity to benthic organisms especially in the A and B series ponds furthest upstream and closest to the IA of the Site HQs exceeded 100 for some chemicals at these sites as shown in Appendix N Figure N5 5 PAHs were the main contributors to risk estimates at most sites in Walnut Creek, accounting for 90 percent or more of the HI in ponds A 1 and B 1 Risk estimates were much lower in the Woman Creek watershed where HIs were below 3 no HQ exceeded 2 6

The risk levels predicted by the HQ and HI calculations were verified using results of sediment toxicity tests and site data on benthic community structure If estimates of potential toxicity (i e TRVs) and exposures were relatively accurate then the extremely wide range of HI and HQ values should correspond to varying levels of toxicity to test organisms and impacts on benthic communities Physical stresses such as fluctuating water levels and the presence of organisms in upper trophic levels (e g fish) represent confounding factors in this analysis However if toxicity is an important factor in controlling benthic community structure then results should indicate some level of correlation between predicted toxicity (i e HIs or HQs) and level of impacts

Correlations were evaluated using cluster analysis and regression methods Cluster analyses (Ludwig and Reynolds 1988) were conducted to determine if groups of sites with similar community composition (e g total organism density and species richness) also had similar HIs or HQs Regression methods (Sokal and

Rholf 1968) were used to estimate if the proportion of variation in community structure could be explained by differences in HIs

Results indicate that predicted toxicity accounts for some of the variation in community composition but other factors are clearly important. Groups that were identified by cluster analvsis based on density richness and pollution tolerance were not similar to those identified when the same analysis was conducted using HIs However differences in HIs accounted for about 50 percent of the variation in rank order of ponds with respect to richness Results of sediment toxicity testing indicated significant toxicity in only Pond B 2 but this pond did not have the highest HIs

These results suggest that although toxicity tests do not show robust toxicity effects of sediment contamination may be manifested in the benthic community structure of the detention ponds However other factors such as size fluctuating water levels and the presence or absence of upper trophic levels are also important Potential toxicity of sediment contaminants particularly PAHs may be important factors in limiting aquatic communities if physical stress was reduced through a change in management of the ponds

It should be noted that the ponds were constructed to minimize offsite transport of contaminants especially radionuclides in sediments and surface water The presence of PAHs and metals in sediments are in part a result of runoff from industrial areas and input from the wastewater treatment plant The fact that sediment contaminant concentrations decrease dramatically with distance downstream indicates that the ponds are effective in attenuating offsite transport of sediment bound contaminants

### 7 3 2 2 Summary of Risks to Aquatic Feeding Birds

Risks from PCBs Sediment contamination in ponds streams and wetlands may also affect wildlife that feed in contaminated areas ECOCs identified for aquatic feeding wildlife in OU 5 included PCBs (Aroclor 1254) mercury and antimony Great blue herons and mallards were identified as representative receptors because birds are more sensitive to many contaminants than mammals Analyses used in the risk characterization are described in Appendix N Section N4 3 The following subsections provide more detail on methods and present results Because the analysis approach differed by chemical results are presented separately for each ECOC

Aroclor 1254 was identified as an ECOC in the 903 Pad ERA source area, primarily due to concentrations detected in sediments in the SID The initial risk calculations were based on estimates of PCB uptake by aquatic biota, because no tissue data were available for the site Initial uptake estimates were based on potential bioconcentration of PCBs from interstitial water When compared to actual data from the B ponds this method greatly overestimated tissue concentrations

Therefore potential risk from PCB exposure was further evaluated using data from B ponds to establish site specific uptake rates for accumulation of PCBs from sediments This information was then used to identify sediment PCB concentrations that would result in exposures equal to or less than the TRVs and thus be protective of aquatic birds These criteria were based on partitioning of PCBs between lipid in biota and organic carbon in sediments The criteria vary with the intensity of site use and complexity of food chains (see Appendix N Table N5 10) The most restrictive criteria are associated with the highest level of site use and longest food chains Available data on PCB concentrations in sediments were then compared to the criteria

Data on total organic carbon in sediment from the SID were not available However the maximum Aroclor 1254 concentration detected in bulk sediments (0 26 mg/kg) was below the average concentrations in sediments of Pond A 3 which represented negligible risk even if aquatic feeding birds obtained all of their food from there Thus sediments of the SID do not appear to represent a risk to aquatic feeding birds

Risks from Mercury Mercury was identified as an ECOC in the C Ponds and the Original Landfill source areas Mercury was identified as a PCOC in soil groundwater stream sediments and pond sediments in OU 5 (see Appendix N Table N5 11A) In each source area, mercury was included as an ECOC because of measured or calculated concentrations in fish tissues

Mercury was detected in 2 of 13 (15 percent) fish collected from Pond C 1 (see Appendix N Table N5 11A) The maximum detected concentration (0 47 mg/kg) was greater than the average dietary concentration (0 027 mg/kg) considered safe for great blue herons (Opresko *et al* 1994) and corresponds to an HQ of 17 Mercury was identified as an ECOC for the Old Landfill source area based on the estimated bioconcentration in fish tissue calculated from the maximum detected concentration in surface water

Mercury was detected in less than 50 percent of samples from all abiotic media in OU 5 except pond sediments (see Appendix N Table N5 11A) Therefore pond sediments are probably the primary source for uptake of mercury by fish However only 15 percent of fish collected from Pond C 1 contain detectable quantities of mercury It is possible that the two samples with detectable quantities may have had sediment in the gastrointestinal tract when analyzed

Actual risks to great blue herons from mercury ingestion are probably less than indicated by the HQ of 17 because this value was calculated using the maximum detected mercury concentration in fish and assumed that the herons obtain all of their food from Pond C 1 Although Great blue herons return frequently to feeding areas they could not use a pond the size of C 1 exclusively Thus the exposure calculation probably overestimates both the exposure point concentration and the frequency of exposure

<u>Risks from Antimony</u> Antimony was identified as an ECOC based on incidental ingestion of sediments from Woman Creek The HQ of 1 6 was based on 100 percent site use by herons in the section of Woman Creek in the Old Landfill source area. This segment of Woman Creek is seasonally intermittent and supports a minimal fish population Herons have not been observed in this area, although they have been sighted at Pond C 1 It is unlikely that a heron would use this segment of Woman Creek to the extent necessary to exceed an HQ of 1

### 7 3 2 3 Summary of Risks to Terrestrial Feeding Raptors

Chromium lead mercury and vanadium were detected in terrestrial arthropods from OU 2 at concentrations that could be toxic to raptors feeding extensively in the areas American kestrels were selected to represent ecological receptors because they have relatively small home ranges and are known to breed at the Site

The preliminary risk estimate for chromium in terrestrial arthropods from OU 2 was based on the maximum detected concentration from the East Trenches source area. Chromium concentrations in terrestrial arthropods from the 903 Pad area were estimated based on data from the East Trenches Thus data were inadequate to accurately estimate exposures However review of the OU 2 data suggests that the maximum concentration was anomolously high and that its use overestimates risk. The mean chromium concentration in OU 2 soils was not elevated compared to background and chromium was included in the PCOCs because of two samples that exceeded the background $UTL_{99/99}$ The OU 2 source areas represent a small portion of the mesic and xeric mixed grassland habitat type at the Site Thus exposure to chromium in OU 2 does not appear to represent a significant ecological risk to kestrels given the low magnitude of the exposures probable overestimate of exposure and relatively small area involved

### 7 3 2 4 Summary of Risks to Small Mammals

Preliminary risk estimates indicated little risk to small mammals from inhalation of organic contaminants volatilizing from subsurface soils into burrow air Risk was evaluated for populations of more common species and individuals of Preble s meadow jumping mouse a species of special concern at the Site

Toluene exceeded the EEC for exposure of small mammals to burrow air in areas of OU 2 that are known to contain buried waste or contaminated soil (see Appendix N Table N5 16 Figure N5 18) Inhalation TRVs were available for only six other organic PCOCs (see Appendix N Attachment 6 Table 9) soil concentrations for these compounds did not exceed TRVs At the time this report was prepared adequate information on respiratory toxicity was not available for most of the organic PCOCs found in soils and inhalation TRVs could not be set. Review of existing information in IRIS (EPA 1994b) indicates that EPA is currently developing reference concentrations (RfCs) for some of the compounds Respiratory exposures were estimated for all organic PCOCs which are presented in Appendix N Attachment 6 Table 9

Toluene irritates mucosal membranes of the eyes and respiratory tract at very low concentrations (EPA 1994b) Therefore animals may avoid areas of contaminated soil when constructing burrows, fortuitously reducing their exposure However for purposes of this study no avoidance behavior is assumed and all areas exceeding the EEC are included in Appendix N Figure N5 18

Areas in which toluene exceeded the EEC were identified using Thiessen polygons These areas covered approximately 0 31 ha in the 903 Pad areas and 0 27 ha in the East Trenches area. All of the affected polygons lie within or adjacent to IHSSs (see Appendix N Figure N5 18) This suggests that risks to burrowing animals from toluene exposure in OU 2 may be restricted to the primary contaminant source areas However risk from organic PCOCs without TRVs remains unclear

Areas impacted by toluene are found in the mesic and xeric mixed grassland habitat types on the ridge between South Walnut Creek and Woman Creek (see Appendix N Figure N5 18) None of the areas overlap with probable Preble s meadow jumping mouse habitat (see Appendix N Figure N5 18) The Thiessen polygons represent about 0 011 percent of the mesic and 0 088 percent of the xeric grassland habitat types at the Site These percentages may be used as a rough estimate of the proportion of burrowing habitat affected for more common species such as deer mice and prairie voles that use the drier more upland areas of the site

### 7 3 2 5 Summary of Risks to Vegetation Communities

Results of the Tier 3 screen indicated that several PCOCs exceed subsurface soil or sediment TRVs in several source areas (see Appendix N Table N3 23) This group of chemicals included mostly metals Concentrations of organic PCOCs did not exceed TRVs (see Appendix N Attachment 6 Table 1) However TRVs were not available for several organic compounds that were PCOCs for subsurface soil and sediments (see Appendix N Attachment 6 Tables 2 and 7) Subsurface soil data were not available for the OU 5 Surface Disturbance no HQs exceeded 1 for PCOCs in the OU 1 881 Hillside or OU 2 East Trenches

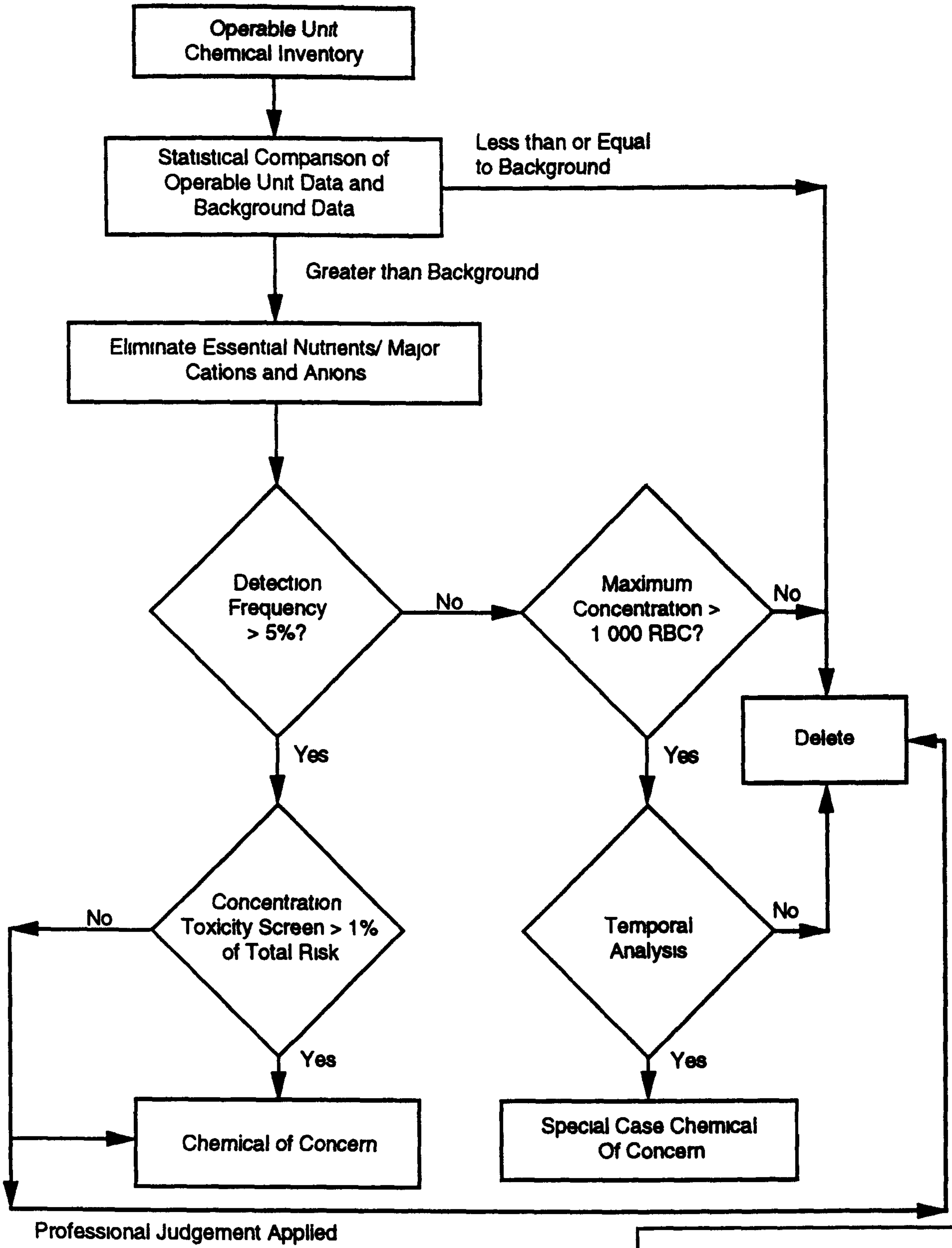
Chromium (7 9) nickel (3 7) and zinc (3 0) all had HQs of 3 or greater in the Ash Pits source area (see Appendix N Table N3 23) All other HQs for metals in subsurface soil were 2 or below Many of the TRVs for metals were equal to the Site background soil concentrations because literature based toxicity values were below the $UCL_{95}$ for background Thus HQs greater than 1 indicate concentrations that exceed background Soil toxicity tests were not conducted using site soils However the risk associated with HQ values near 1 is unclear because background concentrations can vary by orders of magnitude As noted previously areas of obvious vegetation stress were not observed during preliminary field surveys Thus the importance of these risk estimates is not clear

TRVs were not available for most organic soil or sediment PCOCs HQs were well below 1 for organic PCOCs for which TRVs were available However as with metals the potential phytotoxicity of most organic PCOCs was not quantified with plant toxicity tests

### 7 3 2 6 Summary of Risks from Radionuclides

Transuranic radionuclides were identified as PCOCs for most OUs The ECOC screen indicated relatively few areas with radionuclide concentrations (activities) in soils that exceeded TRVs Plutonium 239/240 and americium 241 concentrations in soils exceeded TRVs in two locations in the 903 Pad source areas and uranium 233/234 and uranium 238 concentrations in soils exceeded TRVs at two locations in the Old Landfill source area Radionuclides were also elevated in vegetation and small mammals collected from ERA source areas

The potential risks from radionuclide uptake by biota were evaluated by calculating the internal radiological dose and comparing it to the TRV The TRV was based on a benchmark value of 0 1 rad/day which was identified by IAEA (1992) as protective of biological receptors Results indicated that maximum radionuclide concentrations measured in small mammals resulted in dose rates at least 1 000 times less than the TRV The potential uptake by predators was also evaluated and indicated that risks to predators were also not significant Although abiotic media and biota contain elevated concentrations of transuranic radionuclides the risks of adverse effects appear to be negligible




COC SELECTION PROCESS

| | |
|---|---|
| DRAWN ___ DATE 7-26-95 | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| CHECKED ___ DATE | OU5 WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| APPROVED ___ DATE | FIGURE 6-2 |

F6-2.DRW

**Table 7 1**
**Summary of Risk Estimates for ECOCs by Source Area**

| Source Area | Receptor | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|
| **Woman Creek Watershed** | | | | |
| Woman Creek | Wetland Vegetation Communities | Sediments | Zinc | 1 6 |
| OU5 Ash Pits | Aquatic Species | Surface Water | Barium | 17 |
| | Vegetation Communities | Subsurface Soil | Chromium | 7 9 |
| | | | Nickel | 3 7 |
| | | | Zinc | 3 0 |
| | | | Silver | 2 0 |
| | | | Antimony | 1 3 |
| | | | Copper | 1 1 |
| | | | Lead | 1 1 |
| | | | Cadmium | 1 0 |
| OU5 C Ponds | Aquatic Species | Surface Water | Barium | 24 |
| | Great Blue Heron | Fish | Mercury | 6 4 |
| | Vegetation Communities | Subsurface Soil | Chromium | 2 7 |
| | | | Zinc | 1 1 |
| Pond C 1 | Aquatic Species | Sediments | Benzoic acid | 2 6 |
| | Wetland Vegetation Communities | Sediments | Mercury | 6 0 |
| | | | Zinc | 1 5 |
| Pond C 2 | Aquatic Species | Sediments | Benzoic acid | 1 7 |
| | | | Zinc | 1 3 |
| | Wetland Vegetation Communities | Sediments | Zinc | 2 8 |
| | | Subsurface Soil | Mercury | 2 3 |
| OU5 Original Landfill | Aquatic Species | Surface Water | Barium | 37 |
| | Great Blue Heron | Fish | Mercury | 29 |
| | | Sediments | Antimony | 1 6 |
| | Small Mammals[1] | Surface Soils | Uranium-233/234 | 1 6 |
| | | | Uranium-238 | 23 8 |
| | Vegetation Communities | Subsurface Soil | Copper | 2 6 |
| | | | Zinc | 2 0 |
| OU2 903 Pad | American Kestrel | Terrestrial Arthropods | Chromium | 5 6 |
| | Aquatic Species | Surface Water | Barium | 39 |
| | Great Blue Heron | Fish | Aroclor 1254 | 5 8 |
| | Small Mammals | Burrow Air (Calc from Soils[2]) | Toluene | 1,900 |
| | Small Mammals[1] | Surface Soils | Plutonium-239/240 | 1 92 |
| | Vegetation Communities | Subsurface Soil | Zinc | 1 2 |
| OU2 East Trenches | American Kestrel | Terrestrial Arthropods | Chromium | 4 4 |
| | Small Mammals | Burrow Air (Calc from Soils[2]) | Toluene | 20 |

Radionuclide benchmarks use small mammals as the limiting exposure scenario Preble s meadow jumping mouse was used to represent this group

[2] HQ is for maximum concentration of toluene in soils

**Table 7 2**
**Summary of Ecological Risks for Woman Creek Watershed**

| Receptor Group | ECOCs | ERA Source Area | Media/Exposure Point | Conclusions |
|---|---|---|---|---|
| Wide Ranging Wildlife | None | Not Applicable | Not Applicable | No ECOCs were identified as result of Tier 3 screen |
| Aquatic Life | Metals and organics in sediments | OU2 903 Pad<br>OU5 C Ponds<br>OU5 Original Landfill | Sediments | Risks are primarily due to PAHs in sediments However no toxicity was detected in sediment toxicity tests with *Hyalella azteca* The importance of sediment contamination is unclear but does not appear to be the primary factor controlling benthic community structure |
| Aquatic Feeding Birds | Aroclor 1254 | OU5 C Ponds | Sediments of SID | Aroclor 1254 concentrations in sediment did not exceed risk based criteria developed for sediment at the Site |
| | Mercury | OU5 Original Landfill<br>OU5 C Ponds | Fish Tissue | Mercury was detected in 2 of 24 fish from the C ponds Mercury was not detected in other fish Risks are significant only if birds obtain all food from Pond C 1 |
| | Antimony | OU5 Original Landfill | Sediments | The screening estimate assumes 100% site use Actual use is much less because the stream supports a small fish population Risks were not significant when adjusted for realistic site use factor |
| Terrestrial Feeding Raptors | Chromium | OU2 903 Pad<br>OU2 East Trenches | Terrestrial Arthropods | The mean chromium concentration in soils was not greater than the background mean No clear contaminant source exists Chromium was not a risk to the kestrel population at the Site |
| Small Mammals | Plutonium-239/240<br>Americium 241 | OU2 903 Pad<br>OU2 East Trenches | Soils | Radionuclides do not present significant risk to terrestrial receptors Maximum tissue concentrations do not result in dose rates that exceed TRVs (0 1 rad/day) |
| | Uranium 233/234<br>Uranium 238 | OU5 Original Landfill | Soils | See text for plutonium and americium conclusions |
| | Toluene | OU2 903 Pad<br>OU2 East Trenches | Burrow Air | Organic PCOCs in subsurface soil could volatilize into burrow air Soil toluene concentrations in some areas of OU2 could lead to air concentrations > TRV Little toxicity data are available for assessing other organics |
| Vegetation | Metals | Most Source Areas | Soils Sediments | Soils of the Ash Pits contained several metals with HQs >1 The highest HQ (7 9) was for chromium Ecological risk to vegetation communities is minimal because each of the Ash Pits involves relatively small areas |
| | | | | Sediments of C ponds contain mercury at concentrations that exceed TRVs for wetland vegetation However growth of vegetation in littoral zone appears normal |

# 8 0 PRELIMINARY EVALUATION OF REMEDIAL ALTERNATIVES

Section 5 7 of the OU 5 RFI/RI Work Plan (DOE 1992a) describes the process to be used for the development and screening of remedial alternatives for OU 5 The process to be employed to develop and evaluate alternatives for OU 5 is similar to that described in EPA s *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1988c) and as mandated by the IAG complies with both RCRA and CERCLA guidance This process uses the site-characterization data generated by the RFI/RI along with data generated under other investigations such as treatability studies, to develop refine and select remedial alternatives appropriate for each IHSS where contamination is present and remediation is warranted

The development and screening of remedial alternatives for OU 5 will be conducted under the OU 5CMS/FS program if a further action is warranted. Two technical memoranda will be prepared under the CMS/FS program and will be issued at a later date CMS/FS TM1 Development of Corrective/Remedial Action Objectives will provide a description of corrective/remedial action objectives based on chemical and radionuclide specific standards (when available) site specific risk related factors and other criteria, as appropriate CMS/FS TM2 Detailed Screening of Alternatives will describe the evaluation remedial alternatives applicable to OU 5 against the short and long term aspects of the following specific evaluation criteria.

- Overall protection of human health and the environment,
- Compliance with ARARs
- Long term effectiveness and permanence
- Reduction of toxicity mobility or volume
- Short term effectiveness
- Implementability
- Cost,
- State acceptance and
- Community acceptance

These criteria are described in EPA (1988c) The initial two criteria are considered threshold criteria because these criteria must be satisfied before further consideration of the remaining criteria. The next five criteria are considered the primary criteria on which the analysis is based The final two criteria, state and community acceptance are addressed during the final decision making process after completion of the CMS/FS

# 9 0 PRELIMINARY IDENTIFICATION OF DATA GAPS

Throughout the RFI/RI process it is necessary to evaluate the available data to determine if they are sufficient to define the risk associated with a site and to develop remedial alternatives The observational approach employed for the OU 5 RFI/RI allowed the data collected during each stage of the investigation to be evaluated and subsequent stages to be designed to obtain the data needed for assessing risk (i.e determining the need for remedial action) and for developing remedial alternatives Additionally the field program defined by TM15 (DOE 1994a) was in large part, designed to obtain data needed for the evaluation of remedial alternatives in the OU 5 CMS/FS For example the geotechnical drilling program at IHSS 115/196 was designed to obtain data that are required for an assessment of the stability of the slopes in this area in anticipation that a likely remedial alternative for this area will be to stabilize the slopes and cover the area with a soil cap Also during the drilling program at IHSS 133 to investigate the additional pits identified by the TDEM survey samples of ash were collected from IHSS 133 2 for use in treatability studies

At this time the data collected under the Phase I RFI/RI at OU 5 are believed to be adequate for defining the risk associated with each of the IHSSs (Chapters 6 0 and 7 0) In addition these data are adequate for the development and screening of remedial alternatives As the OU 5 CMS/FS progresses additional data gaps may be identified, and data gathering programs will be developed to fill these gaps

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# 10 0 SUMMARY AND RECOMMENDATIONS

This chapter summarizes the results of the OU 5 Phase I RFI/RI and provides recommendations for additional investigations that may be required

## 10 1 SUMMARY

A Phase I RFI/RI of OU 5 was conducted as directed by the Interagency Agreement of 1991 The purpose was to assess the site physical characteristics characterize contaminant sources and the nature and extent of potential contamination in surface soil subsurface soil groundwater surface water sediment, and air assess fate and transport of environmental contaminants and estimate potential risks to human health and the environment from the identified contaminants from the identified contaminants

Field investigations indicate that the site physical characteristics are complex. Site meteorologic geologic hydrologic and hydrogeologic conditions are interconnected and provide mechanisms and pathways for surface and subsurface constituents to migrate through the environment. For example because most of the UHSU groundwater pathways discharge to surface water within OU 5 thus there is limited potential for migration of VOCs to offsite locations via groundwater

The nature and extent of environmental contamination within OU 5 have been characterized through the collection analysis and assessment of hundreds of samples of various environmental media. Environmental samples were analyzed for a comprehensive suite of chemicals to help characterize potential contamination associated with waste handling and disposal practices conducted during the operating history of Rocky Flats in the area of OU 5 The OU 5 data assessment process including rigorous data validation, was designed to be conservative to ensure a healthy protective and comprehensive understanding of potential contamination conditions in OU 5

The results of the OU 5 data assessment indicated the presence of PCOCs in surface soil subsurface soil groundwater pond seep and stream water and pond seep and stream sediments PCOCs identified in one or more of these environmental media include VOCs SVOCs PCBs/pesticides metals and other inorganic constituents including radionuclides The Phase I RFI/RI indicated that both the lateral and vertical extent of the PCOCs are limited The limited extent of PCOC migration is due to the low hydraulic conductivities the hydrogeologic setting and the small amounts of highly mobile wastes disposed in OU 5 The list of PCOCs for each medium was then screened using risk based and other screening methods to identify COCs for both the HHRA and the ERA COCs were identified as the chemicals in each medium that were likely to contribute at least 1 percent of overall risk **(incorporate ERA results when available)** For the HHRA COCs were selected on an OU wide basis for the ERA the COCs were identified for the Woman Creek watershed In groundwater and surface water metals and radionuclides are the primary COCs however in seep water the COCs are all VOCs The COCs in surface soil and subsurface soil include uranium isotopes several metals PAHs and PCBs In all sediments radionuclides and metals are the only COCs

The presence of COCs in all media is a result of historical releases to the environment Under the hydrogeochemical conditions of OU 5 metals and radionuclides are not expected to be very mobile via the groundwater pathway However several mechanisms of contaminant transport are present, such as storm water runoff which may transport contaminated soils to surface waters with subsequent transport to downstream receptors The presence of COCs in stream seep and pond sediments as a result of surface water transport of contaminated surface soils to and along Woman Creek, supports this exposure mechanism Fugitive dust emissions from OU 5 surface soils and dry sediments may also contribute contaminated particulates to future onsite receptors Exposure to subsurface soils by future onsite construction workers may result from contaminant inhalation and ingestion during an excavation

The results of the OU 5 HHRA indicate estimated health risks and annual radiation doses for current and future onsite receptors who could potentially be exposed directly or indirectly to COCs at, or released from sources in OU 5 Exposure scenarios that were evaluated involved a current industrial worker (security guard) a future industrial/office worker a future ecological researcher a future open space recreational user and a future construction worker Future onsite residential receptors were not considered in the HHRA because future land use plans do not include residential use It was determined during HHRA negotiations with the regulatory agencies that health risks to offsite receptors would not be addressed on an OU specific basis but would best be examined on a sitewide basis

For the HHRA exposure media that were evaluated included surface soil subsurface soil outdoor and indoor air stream seep and pond water and stream seep and pond sediments Groundwater was not evaluated as an exposure pathway because there are no current or future receptors

Risks were evaluated for three AOCs The Original Landfill (IHSS 115/196 Source Area) is AOC No 1and AOC No 2 includes the Ash Pits (IHSS 133 Source Area) AOC No 3 includes the SID and the Pond C 2 Source Area, Woman Creek and due Pond C 1 Source Area

The risk characterization process combines average and reasonable maximum estimates of exposure with upperbound estimates of toxicity in order to yield conservative (protective) estimates of human health risk. Estimates of human health risk for average (CT) and RME conditions are provided so that risk management decisions can be based on a range of potential risks for different exposure scenarios

The following are the major conclusions of the HHRA

- AOC1 Cumulative HIs were below 1 and RME cancer risk estimates were 3E-05 or below for all receptors The maximum cancer risk estimate of 3E 05 for both the current worker (security guard) and the future office worker this risk is still within EPA s acceptable risk range of 1E-06 to 1E-04 External irradiation due to exposure of uranium 238 in surface soil is the primary contributor to this estimate of cancer risk.
- AOC2 Cumulative HIs were below 1 and RME cancer risk estimates were 4E-06 or below for all receptors The maximum cancer risk estimate of 4E-06 for both the current worker (security guard) and the future office worker this risk is at the low end of EPA s acceptable risk range of 1E-06 to 1E-04 External irradiation due to exposure of uranium 238 in surface soil is the primary contributor to this estimate of cancer risk.
- AOC3 Cumulative HIs were below 1 and the RME cancer risk estimates were below EPA s point of departure of 1E-06 for both receptors These results indicate that no adverse noncarcinogenic health hazards and negligible cancer risk are expected for all receptors evaluated

The ERA for Woman Creek was conducted for aquatic and terrestrial biota exposed to contaminants in OUs 1 2 and 5 Assessment of ecological risks was based on evaluating exposure of biological receptors to PCOCs in designated ERA source areas Source areas include individual or groups of IHSSs within an OU and were based on abiotic and biotic sampling locations in and around IHSSs A preliminary exposure and risk calculation was conducted for PCOCs in source areas The analysis was conducted to estimate the contribution of each PCOC and each source area to overall risk in the watershed. Ecological chemicals of concern (ECOCs) were identified from preliminary risk calculations and evaluated further in risk characterization

Ecotoxicological risk to terrestrial receptors in OU 5 was minimal Concentrations (activities) of uranium 233/234 and uranium 238 in soils exceeded the risk based screening criteria developed for the Site

However the criteria were exceeded in only two locations both of which are in the Old Landfill source area and which represent a negligible portion of habitat in the watershed In addition maximum concentrations of radionuclides in small mammals were not associated with levels that exceed the benchmarks for safe radiological doses Thus risk from exposure to radionuclides appears to be minimal

The screening level assessment also indicated that concentrations of mercury antimony and Aroclor 1254 could represent risks to aquatic feeding birds if they acquired all of their food from the SID Pond C 1 and segments of Woman Creek. However it is unlikely that birds would spend all of the time in the areas of concern because the size and quality of habitat in these areas is inadequate to support their needs

## 10 2 RECOMMENDATIONS

The results of the HHRA support the conclusions that environmental contamination within OU 5 does not pose a threat to human health under the evaluated exposure scenarios Therefore remediation of environmental media to address risk to human health and the environment is not warranted In addition no further investigations are recommended

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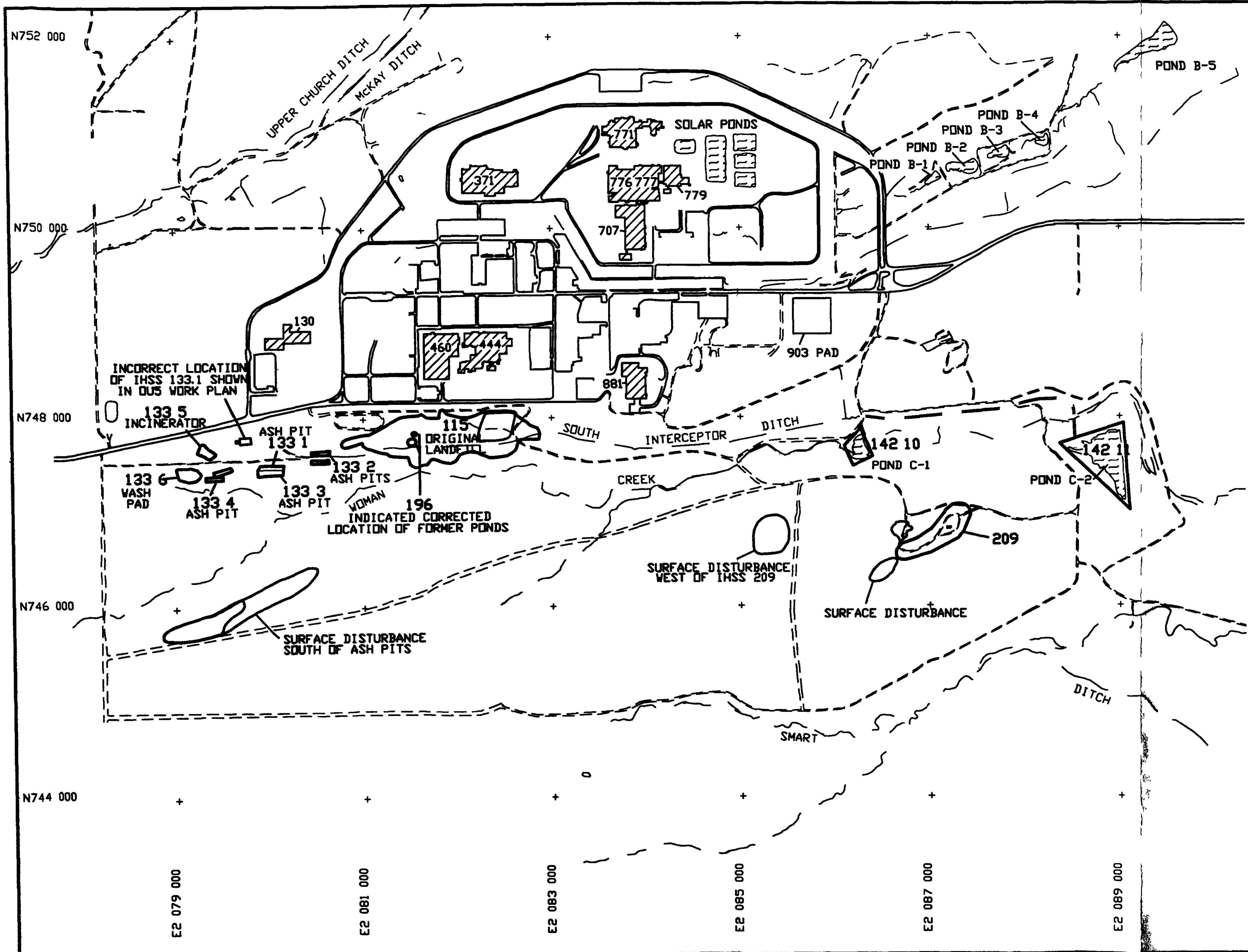


MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- SURFACE WATER IMPOUNDMENTS
- BUILDINGS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)

N

0 500 1000

SCALE 1 = 1000

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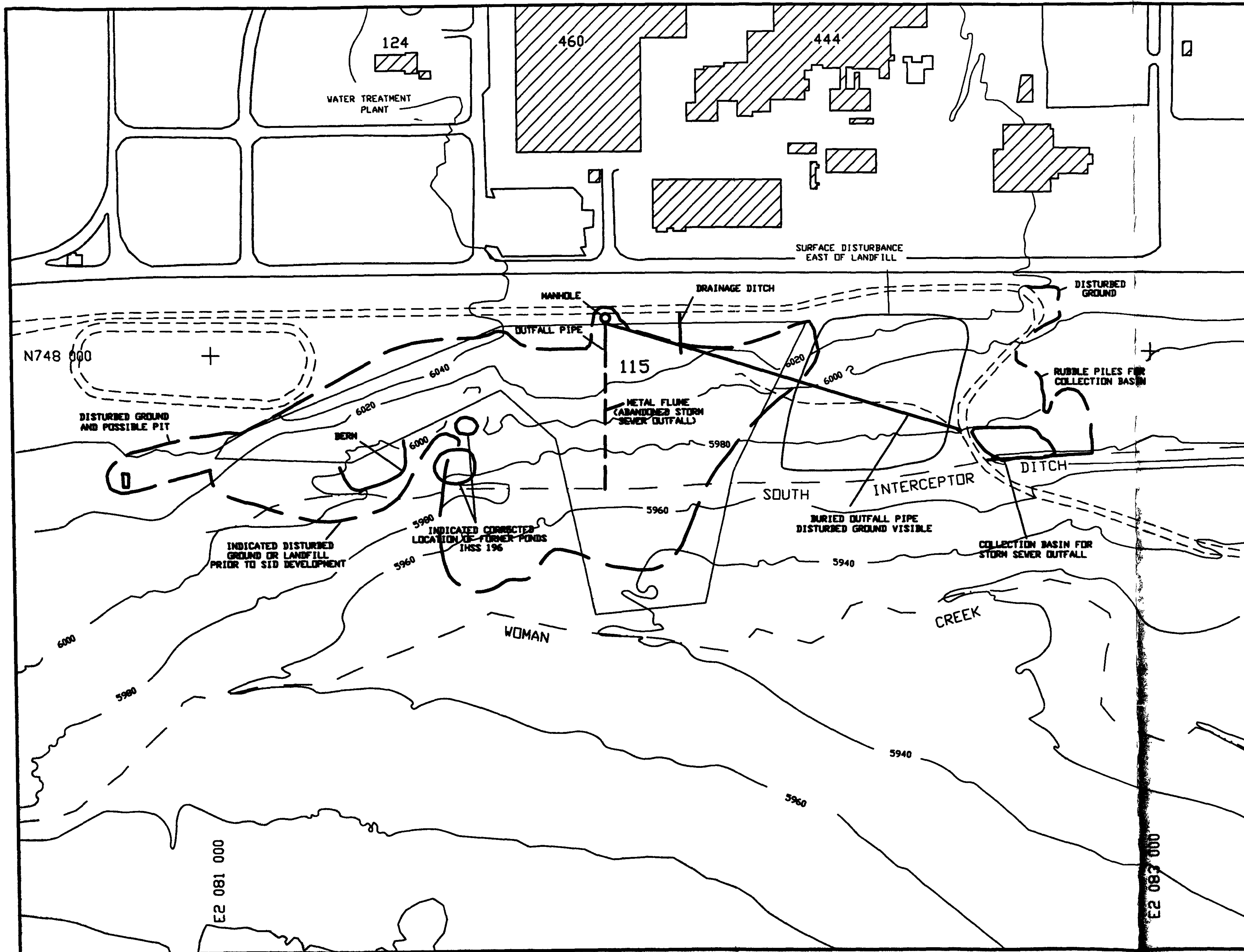
**WOMAN CREEK PRIORITY DRAINAGE AREA (OPERABLE UNIT No 5)**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 1-2

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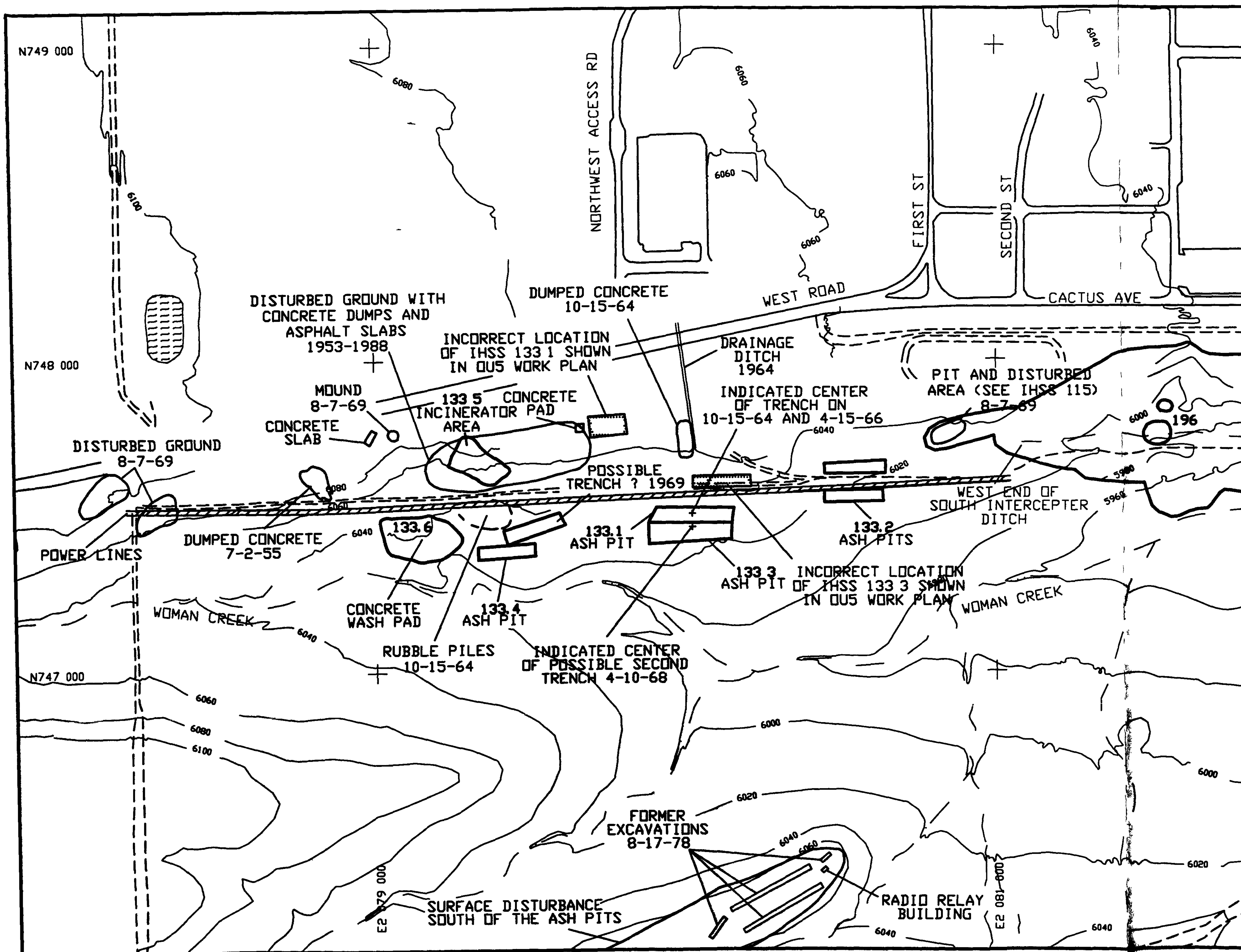
**IHSS 115 ORIGINAL LANDFILL AND EXTENDED AREAS AND IHSS 196 FILTER BACKWASH POND**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 1-3

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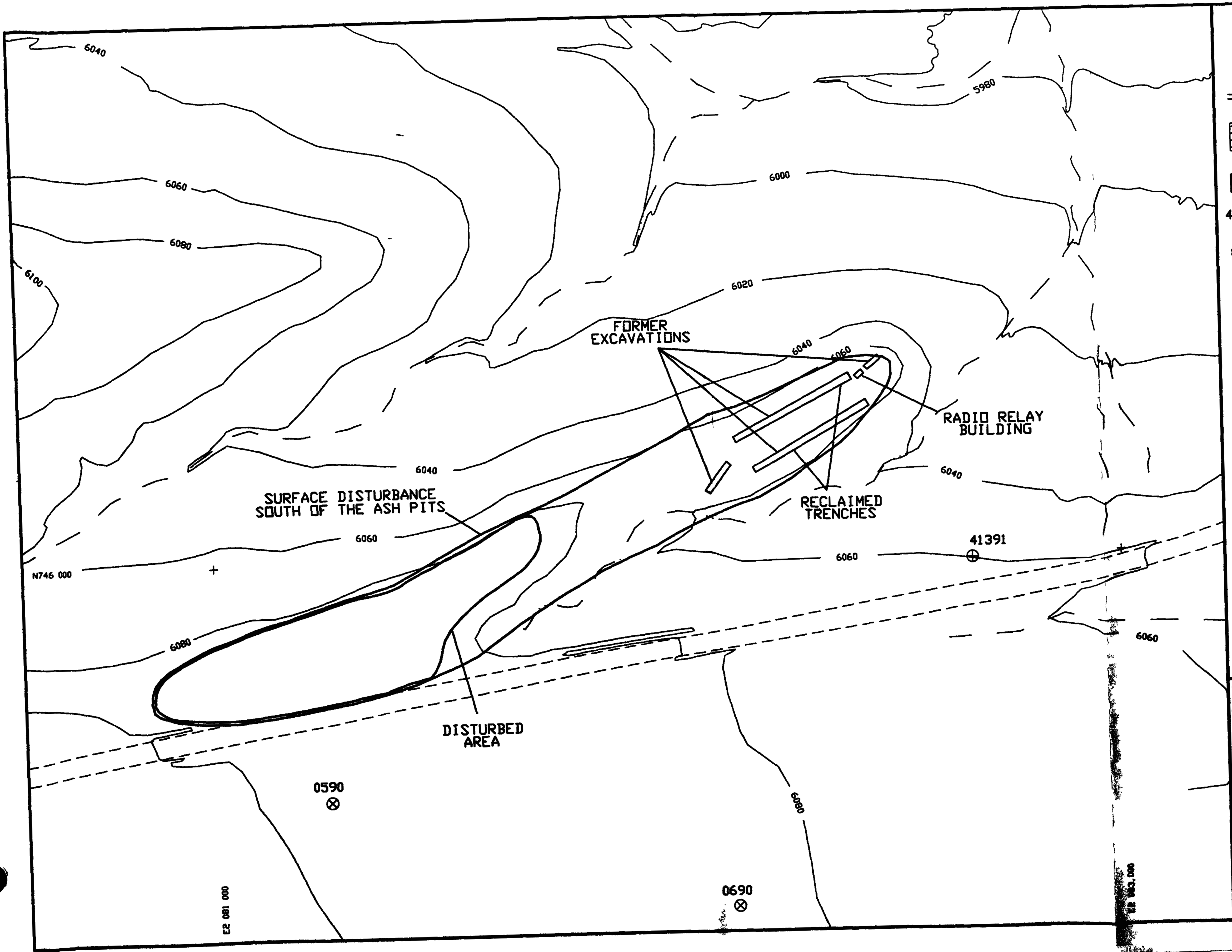
**REVISED LOCATIONS OF IHSS 133 SITES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 1-4

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**SURFACE DISTURBANCE SOUTH OF THE ASH PITS LOCATION MAP**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

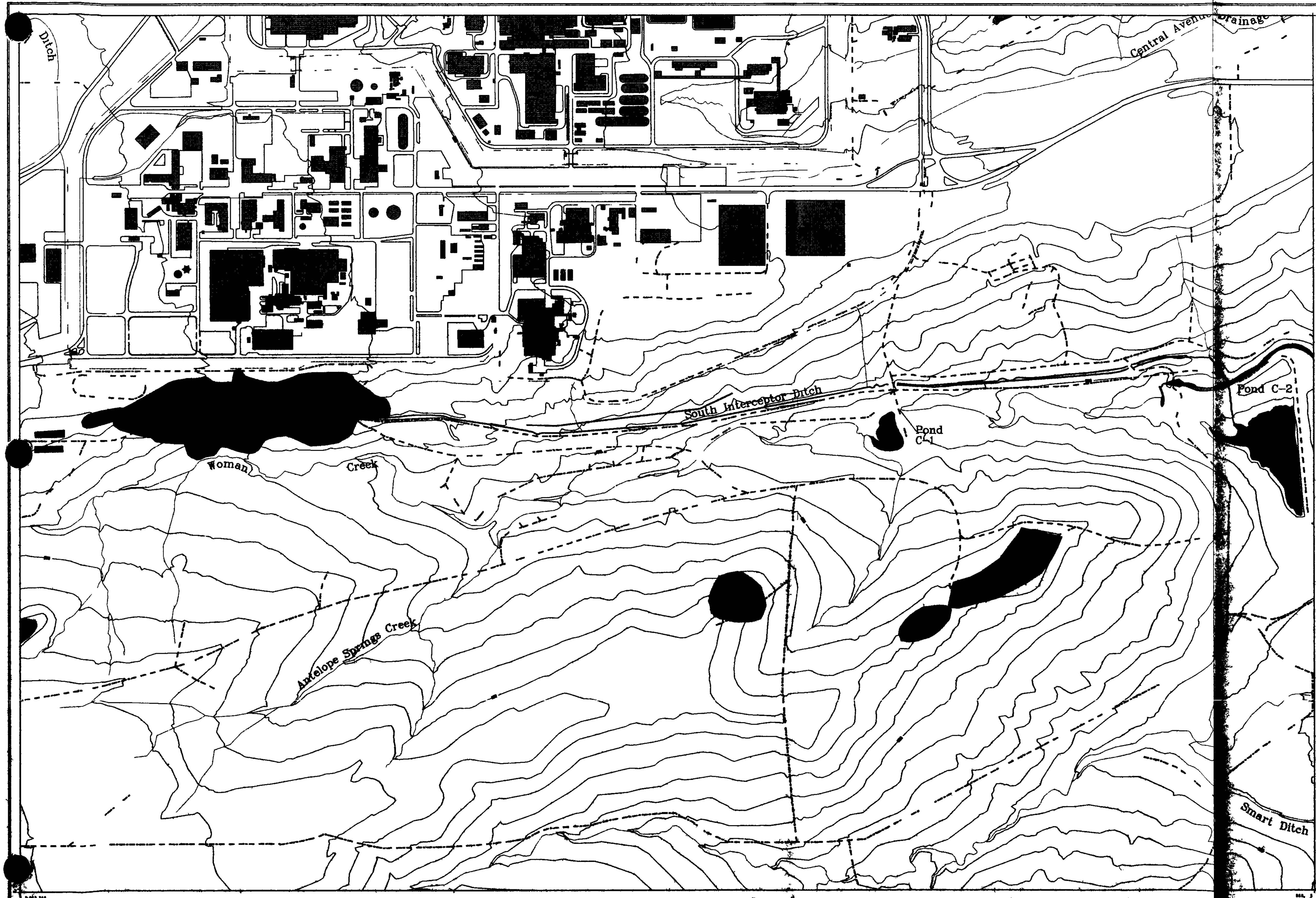
OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 1-6

# Map showing location of the South Interceptor Ditch (SID)

**Figure 1 7**




## EXPLANATION

- Operable Unit 5 IHSS s
- Surface Disturbance
- Individual Hazardous Substance Sites (IHSS)
- South Interceptor Ditch
- French Drainage System

**Standard Map Features**

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Contours (20 intervals)
- Paved roads
- Dirt roads

*DATA SOURCE:*
*Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991.*
*Hydrology provided by USGS (date unknown)*
*Individual Hazardous Substance Sites (IHSS's) are determined by the following:*
*OU1 RFI/RI Phase III Report*
*OU2, 4, 7, 11, & 15 HRR*
*The remaining OU's are defined by their respective Operation Unit Workplan.*

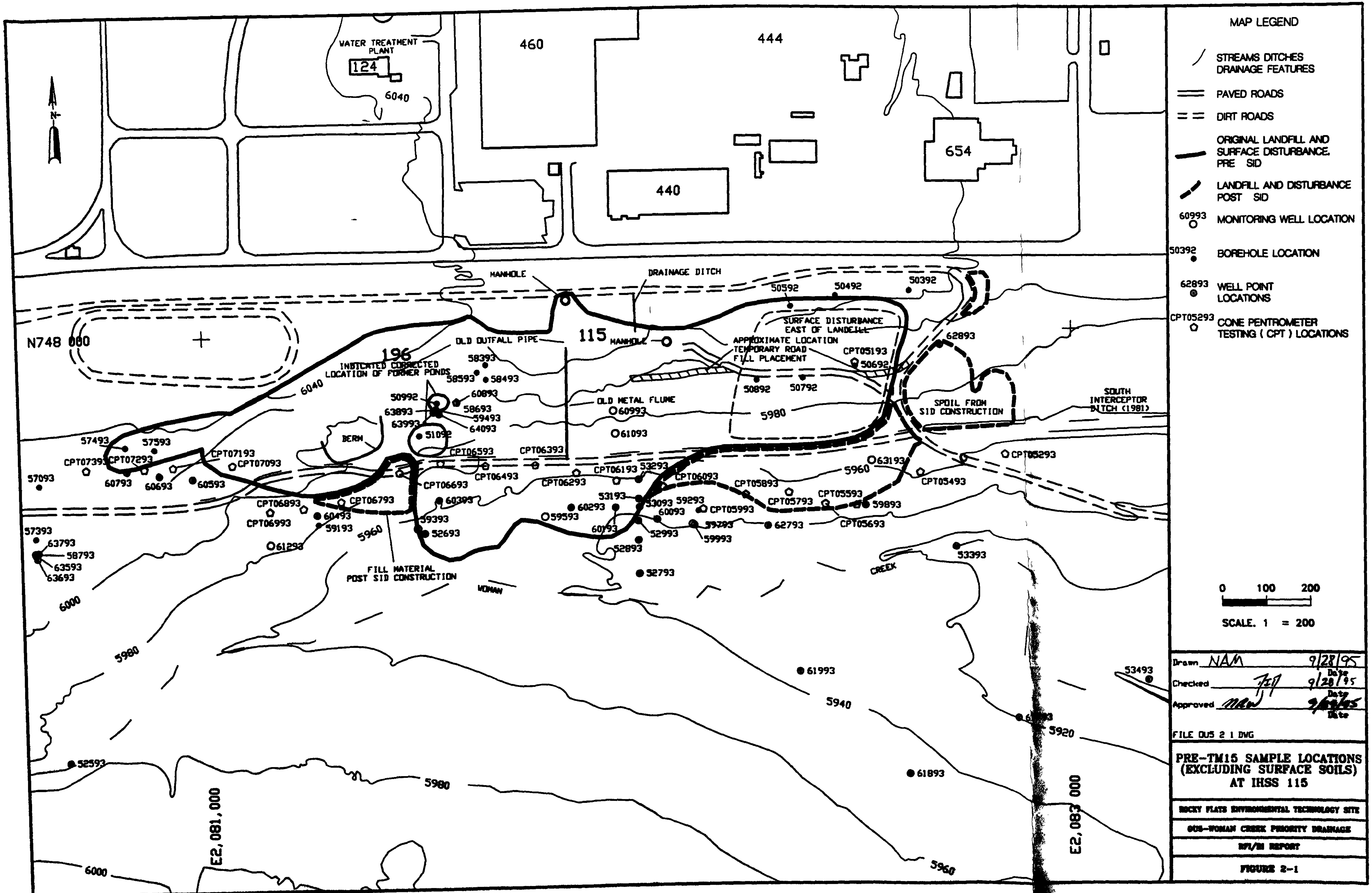
Scale 1 : 7980
inch represents approximately 683.33 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
RMRS Rocky Mountain Remediation Services, L.L.C.

September 19, 1995


MAP LEGEND
STREAMS DITCHES DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
ORIGINAL LANDFILL AND SURFACE DISTURBANCE, PRE SID
LANDFILL AND DISTURBANCE POST SID
60993 MONITORING WELL LOCATION
50392 BOREHOLE LOCATION
62893 WELL POINT LOCATIONS
CPT05293 CONE PENTROMETER TESTING ( CPT ) LOCATIONS
0 100 200
SCALE. 1 = 200
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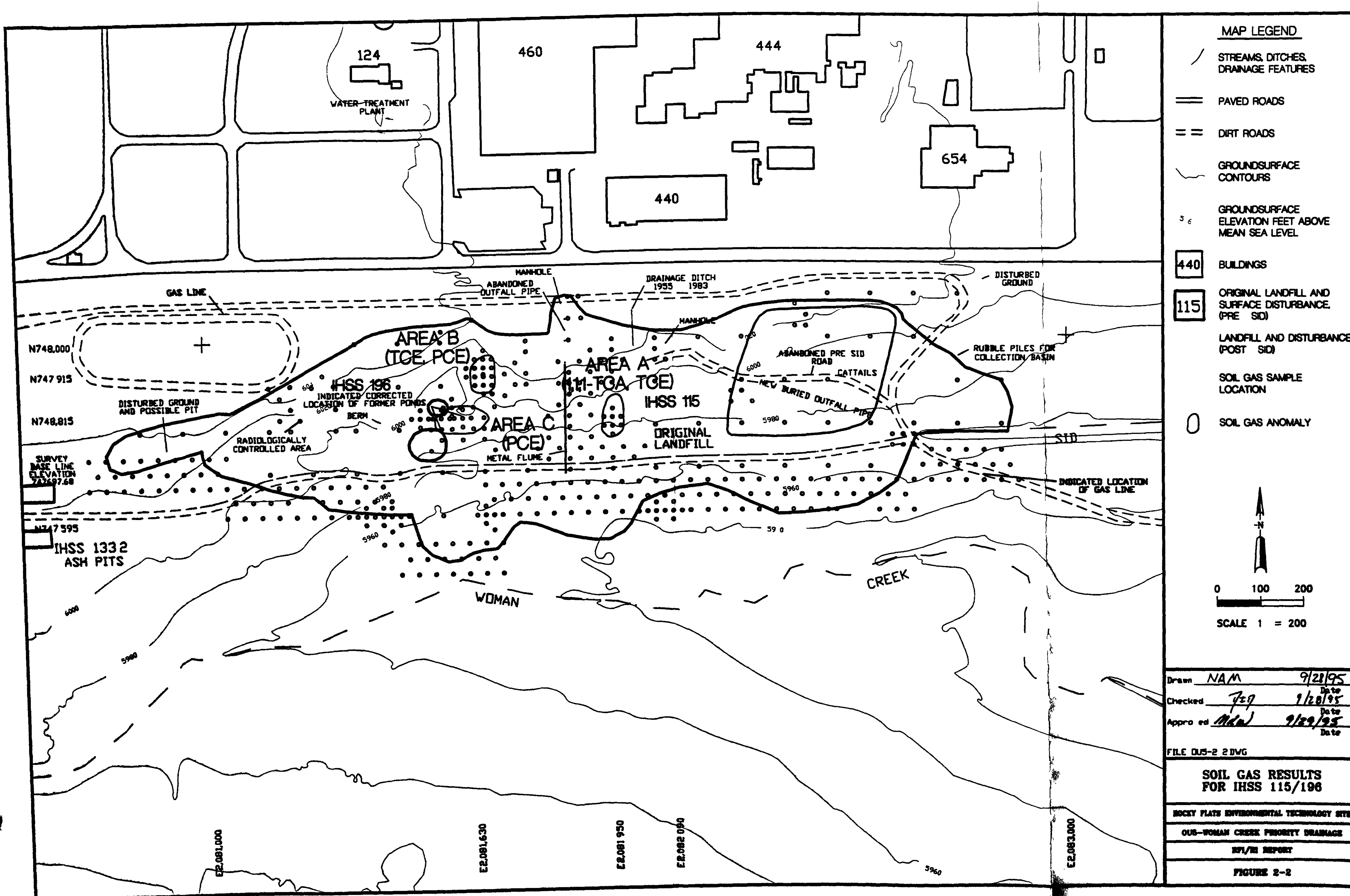
FILE OUS 2 1 DWG
PRE-TM15 SAMPLE LOCATIONS (EXCLUDING SURFACE SOILS) AT IHSS 115
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 2-1
WATER TREATMENT PLANT
124
460
444
440
654
MANHOLE
DRAINAGE DITCH
115
196
OLD OUTFALL PIPE
INDICATED CORRECTED LOCATION OF FORMER PONDS
OLD METAL FLUME
SURFACE DISTURBANCE EAST OF LANDFILL
APPROXIMATE LOCATION TEMPORARY ROAD FILL PLACEMENT
SPOIL FROM SID CONSTRUCTION
SOUTH INTERCEPTOR DITCH (1981)
BERM
FILL MATERIAL POST SID CONSTRUCTION
WOMAN
CREEK
N748 000
E2,081,000
E2,083 000


124
WATER TREATMENT PLANT
460
444
654
440
GAS LINE
MANHOLE
ABANDONED OUTFALL PIPE
DRAINAGE DITCH 1955 1983
DISTURBED GROUND
MANHOLE
RUBBLE PILES FOR COLLECTION BASIN
ABANDONED PRE SID ROAD
CATTAILS
NEW BURIED OUTFALL PIPE
AREA B (TCE, PCE)
AREA A (111-TCA, TCE)
AREA C (PCE)
IHSS 196
IHSS 115
INDICATED CORRECTED LOCATION OF FORMER PONDS
BERM
ORIGINAL LANDFILL
METAL FLUME
RADIOLOGICALLY CONTROLLED AREA
DISTURBED GROUND AND POSSIBLE PIT
N748,000
N747 915
N748,815
SURVEY BASE LINE ELEVATION
N747 595
IHSS 1332 ASH PITS
SID
INDICATED LOCATION OF GAS LINE
WOMAN
CREEK
6000
5980
5960
E2,081,000
E2,081,630
E2,081 950
E2,082 090
E2,083,000
MAP LEGEND
STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
GROUNDSURFACE CONTOURS
GROUNDSURFACE ELEVATION FEET ABOVE MEAN SEA LEVEL
440
BUILDINGS
115
ORIGINAL LANDFILL AND SURFACE DISTURBANCE (PRE SID)
LANDFILL AND DISTURBANCE (POST SID)
SOIL GAS SAMPLE LOCATION
SOIL GAS ANOMALY
N
0 100 200
SCALE 1 = 200
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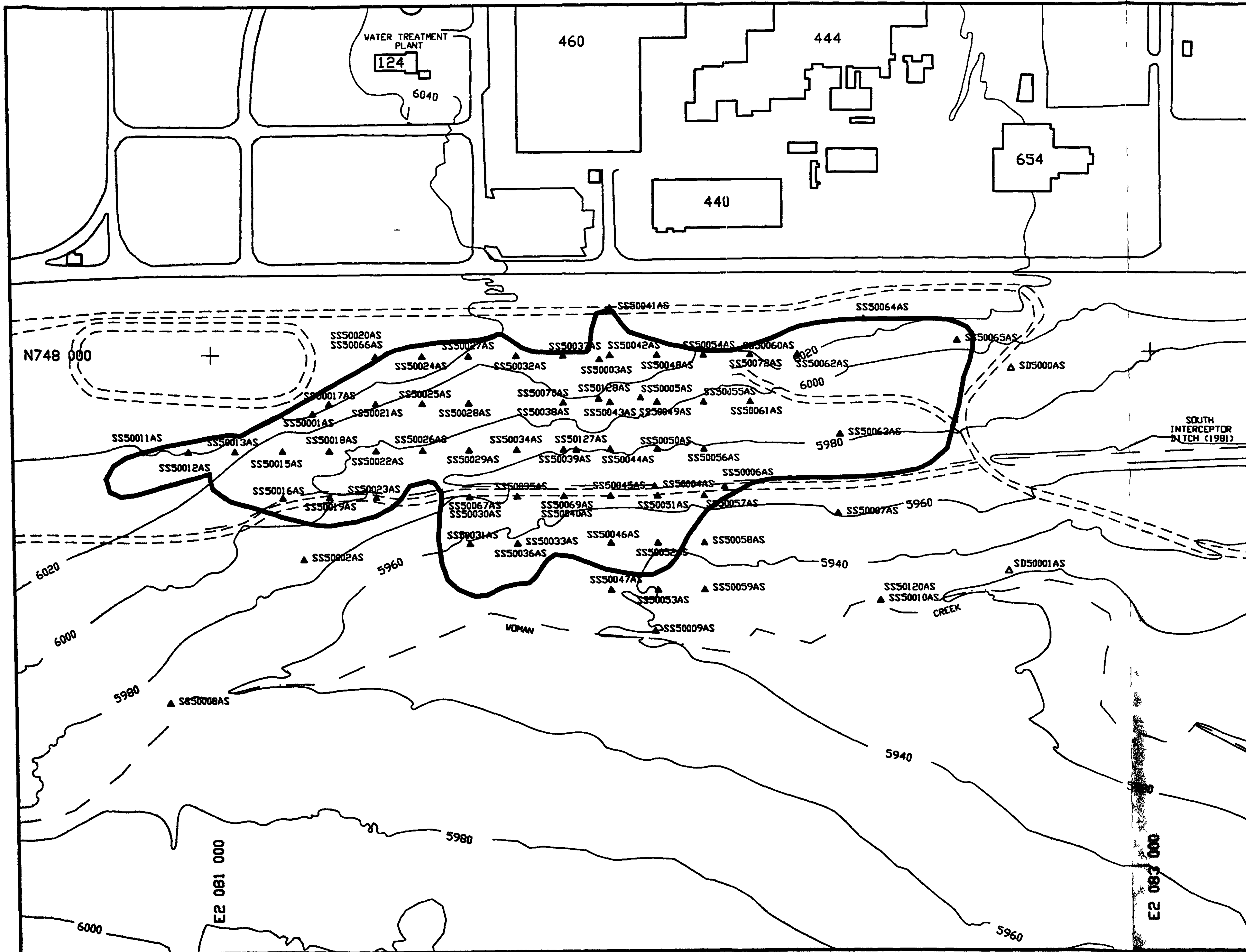
FILE OU5-2 2 DWG
SOIL GAS RESULTS FOR IHSS 115/196
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 2-2




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

LANDFILL BOUNDARY SURFACE DISTURBANCE, PRE SID

SS50053AS SURFACE SOIL SAMPLE LOCATION

SD5000AS SEEP SEDIMENT SAMPLE LOCATION

N

0 100 200

SCALE 1 = 200

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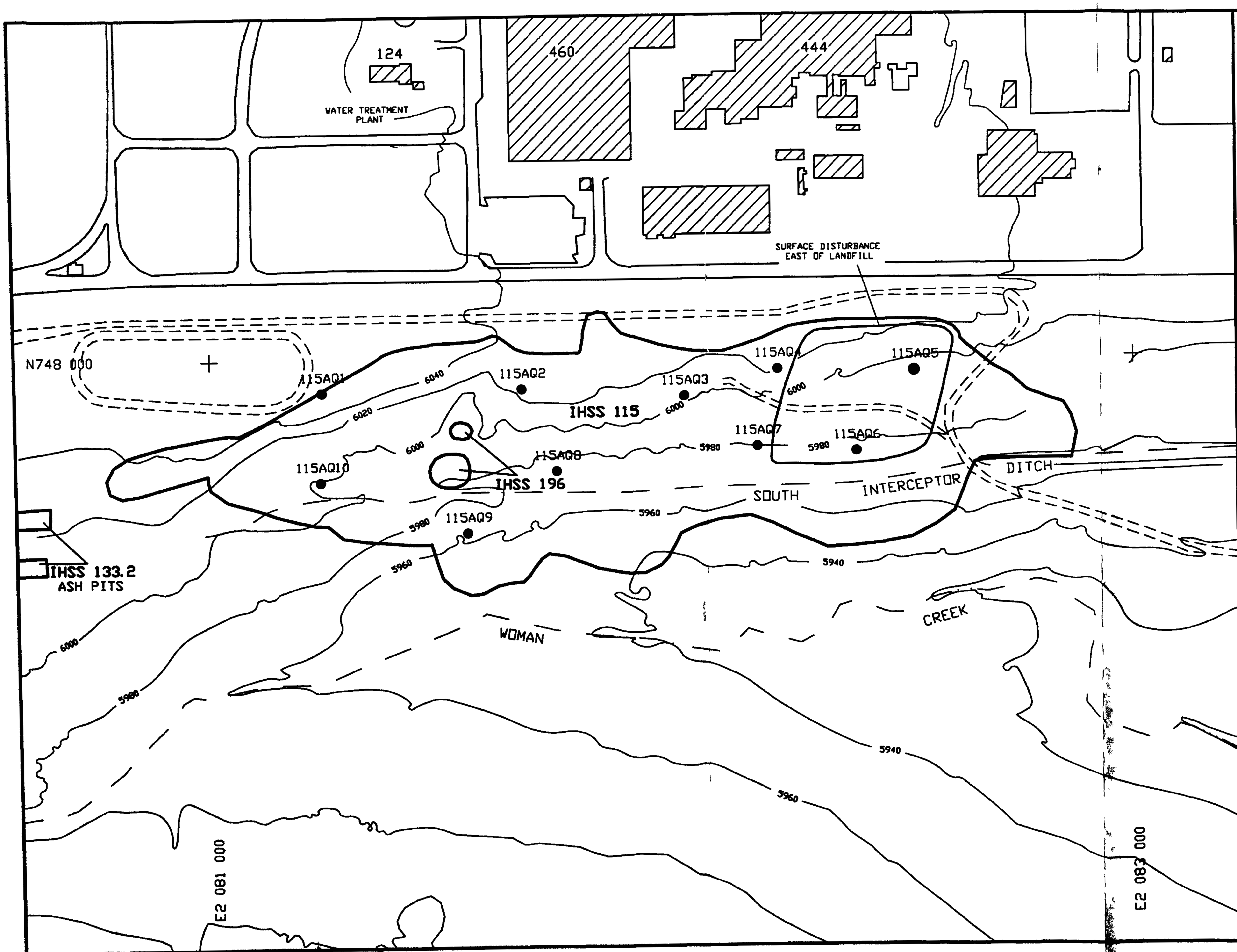
SURFACE SOIL AND SEEP SEDIMENT SAMPLE LOCATIONS IHSS 115

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-3

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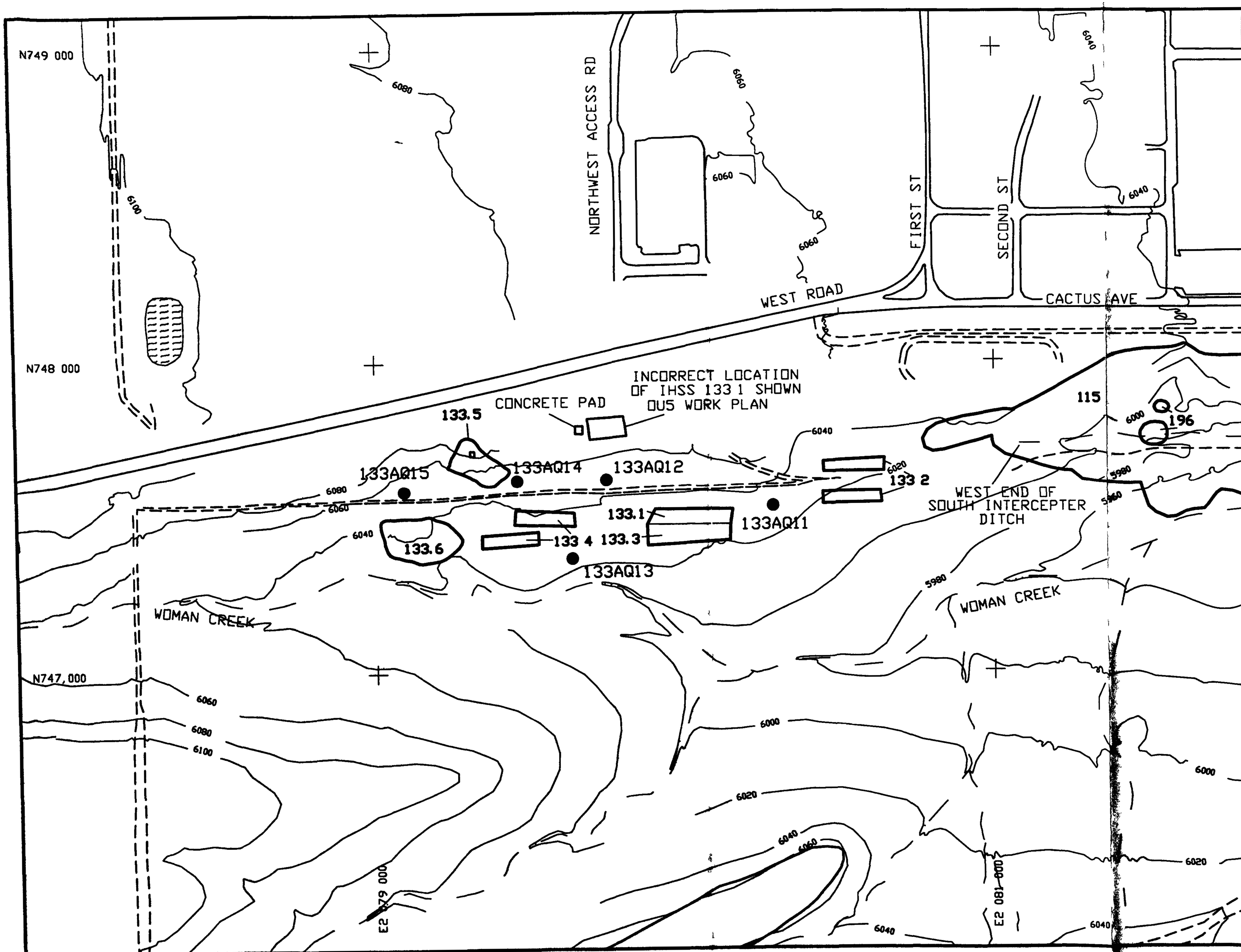
**OU5 WIND RESUSPENSION POTENTIAL STUDY LOCATIONS IN IHSS 115**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-6

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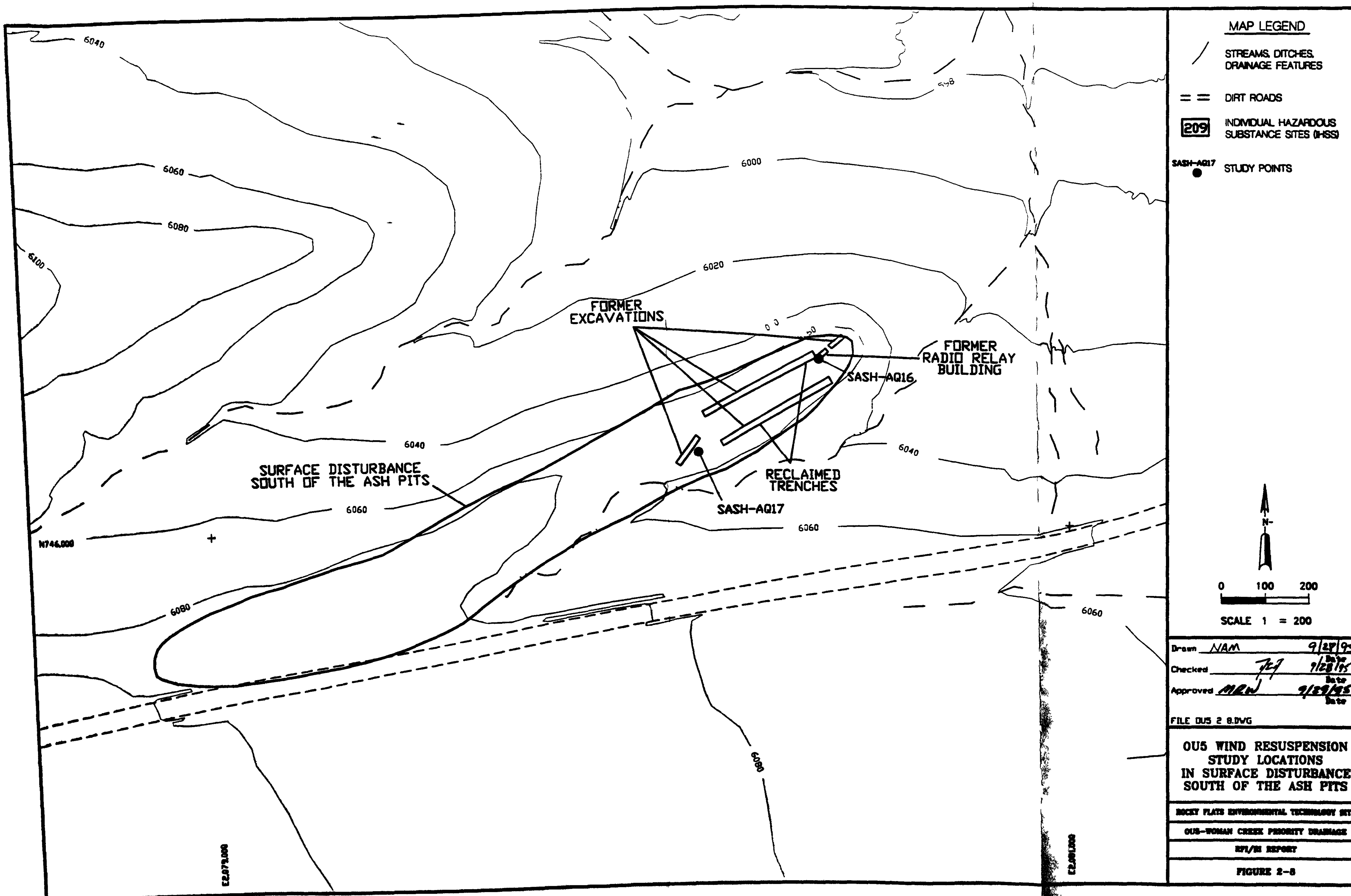
**OU5 WIND RESUSPENSION POTENTIAL STUDY LOCATIONS IN IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 2-7

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Approved MRW 9/29/95 Date

FILE OU5 2 8.DWG

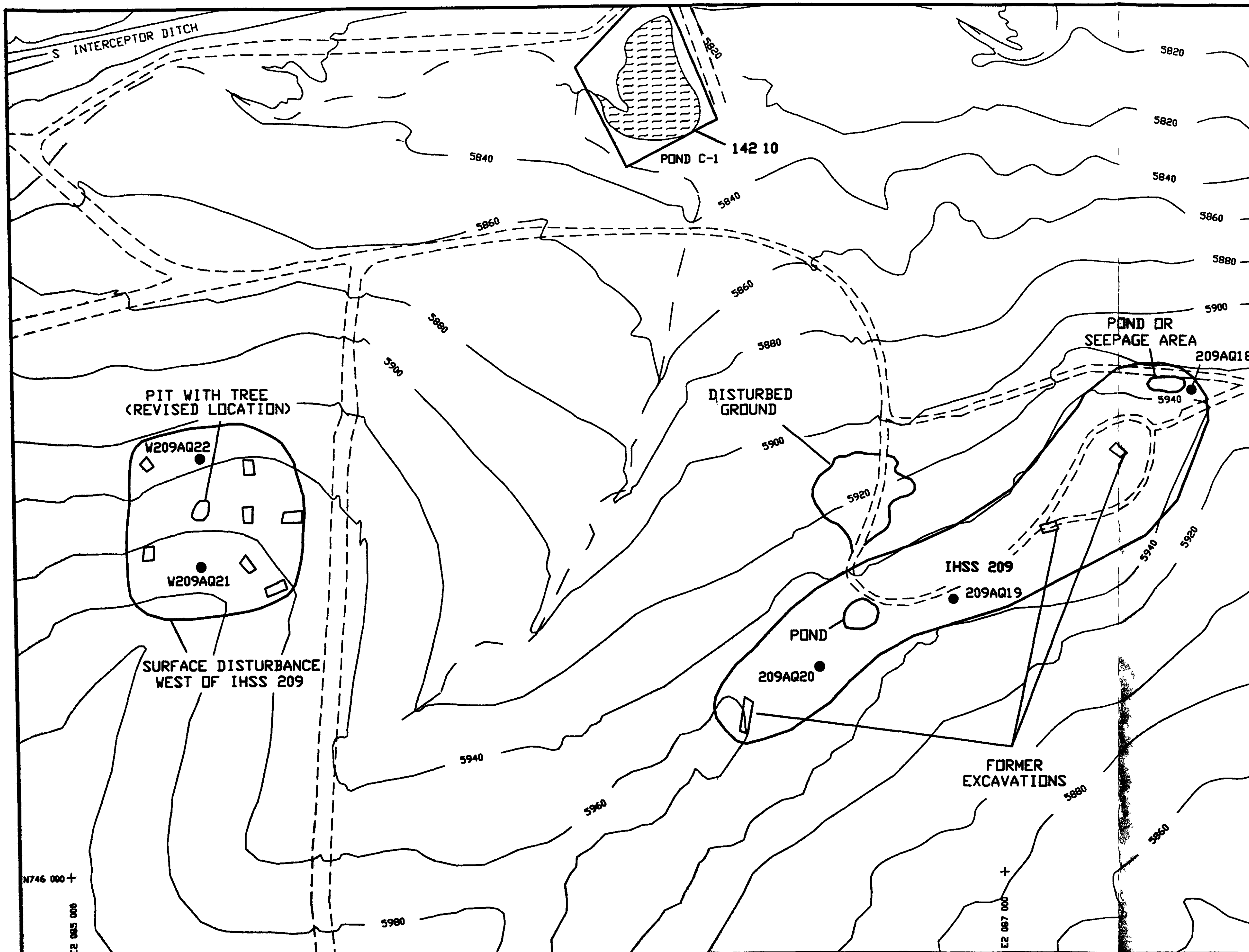
**OU5 WIND RESUSPENSION STUDY LOCATIONS IN SURFACE DISTURBANCE SOUTH OF THE ASH PITS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-8




Dr n SAB 7/27/95 Date
Checked 7I7 7/27/95 Date
Appr ved Date
Fil OU5 2 9 DWG

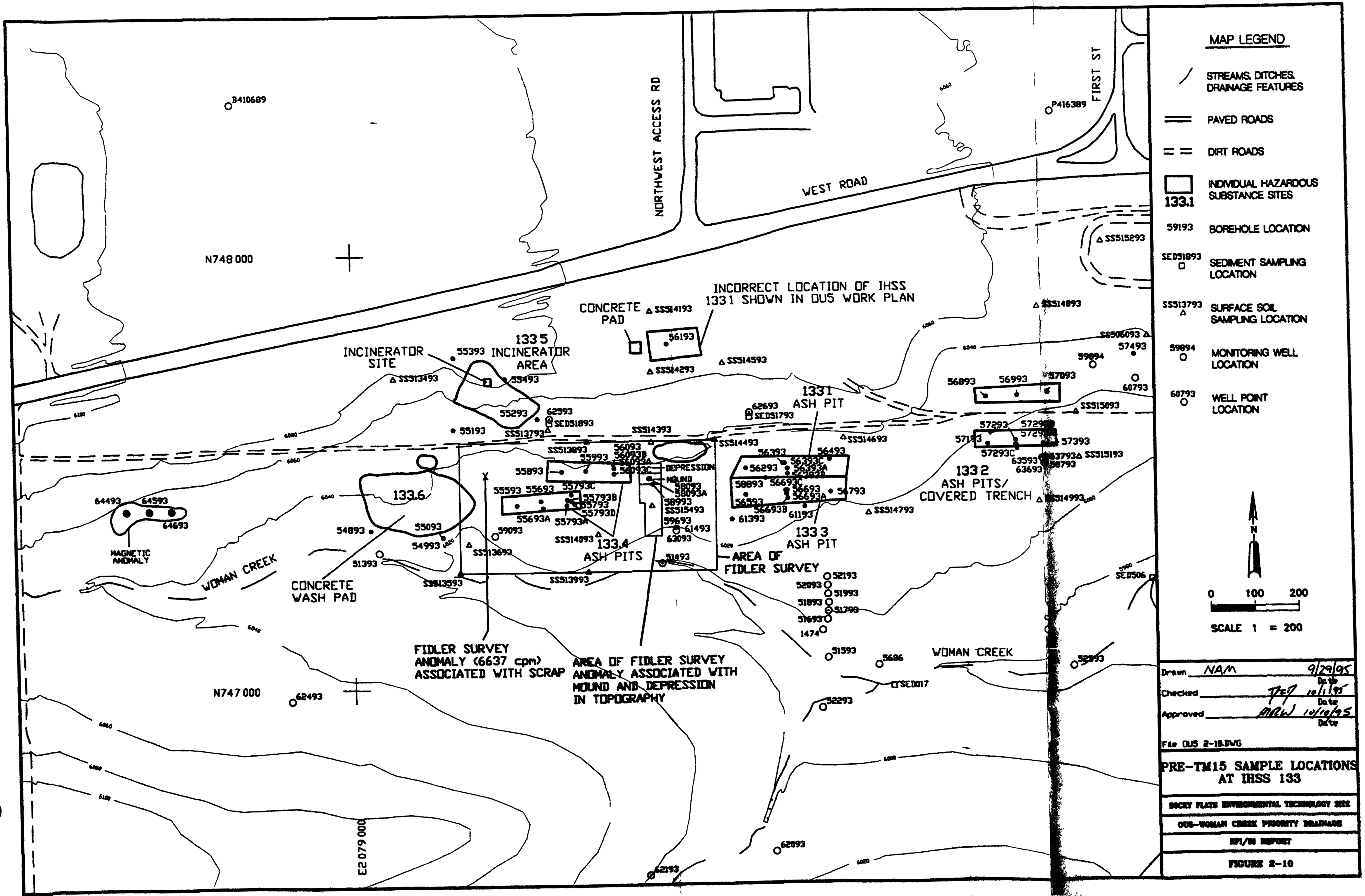
**OU5 WIND RESUSPENSION POTENTIAL STUDY LOCATIONS IN IHSS 209 AND SURFACE DISTURBANCE WEST OF IHSS 209**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

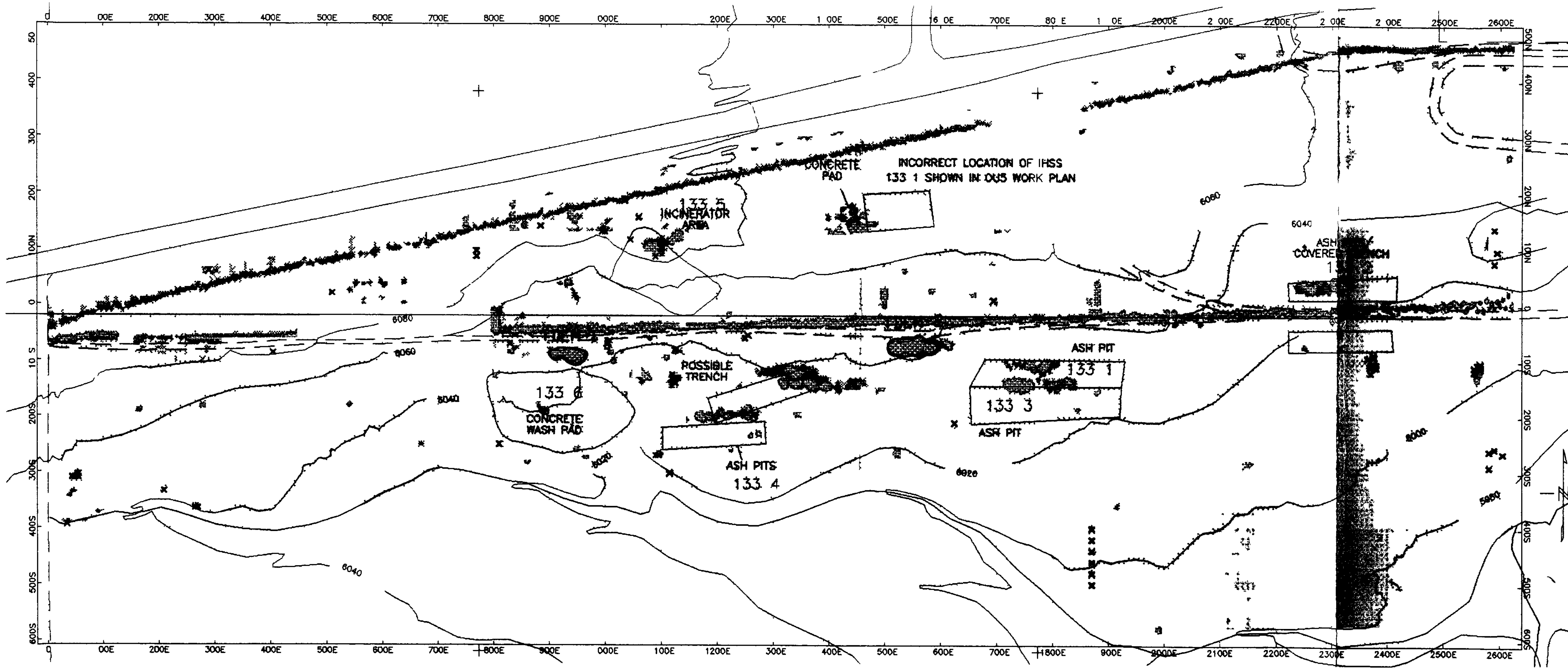
OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-9



MAP LEGEND
STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
INDIVIDUAL HAZARDOUS SUBSTANCE SITES
133.1
59193 BOREHOLE LOCATION
SED51893 SEDIMENT SAMPLING LOCATION
SS513793 SURFACE SOIL SAMPLING LOCATION
59894 MONITORING WELL LOCATION
60793 WELL POINT LOCATION
N
0 100 200
SCALE 1 = 200
Drawn NAM 9/29/95 Date
Checked 10/1/95 Date
Approved MRW 10/10/95 Date
File OU5 2-10.DWG
PRE-TM15 SAMPLE LOCATIONS AT IHSS 133
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 2-10
NORTHWEST ACCESS RD
WEST ROAD
FIRST ST
N748 000
N747 000
E2 079 000
INCORRECT LOCATION OF IHSS 1331 SHOWN IN OU5 WORK PLAN
CONCRETE PAD
133.5 INCINERATOR AREA
INCINERATOR SITE
1331 ASH PIT
133.2 ASH PITS/ COVERED TRENCH
133.3 ASH PIT
133.4 ASH PITS
133.6
AREA OF FIDLER SURVEY
DEPRESSION
MOUND
MAGNETIC ANOMALY
CONCRETE WASH PAD
WOMAN CREEK
FIDLER SURVEY ANOMALY (6637 cpm) ASSOCIATED WITH SCRAP
AREA OF FIDLER SURVEY ANOMALY ASSOCIATED WITH MOUND AND DEPRESSION IN TOPOGRAPHY

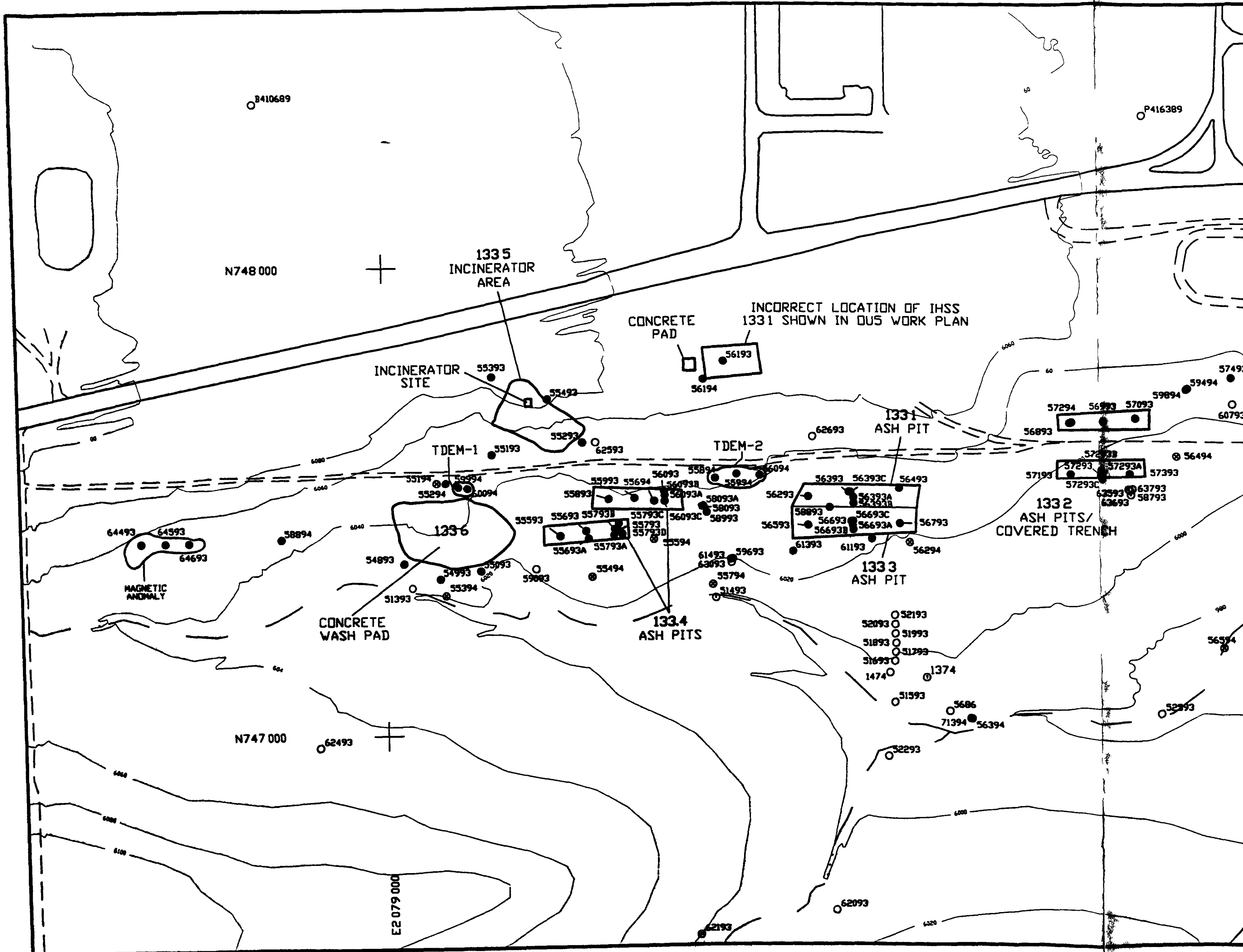



IHSS LOCATIONS SHOWN ON THIS FIGURE WERE SUBSEQUENTLY REVISED (SEE FIGURE 1 2)

X SURFACE METALLIC DEBRIS IDENTIFIED DURING SURVEY

SCALE 1 = 200

| | |
|---|---|
| D aw SAB 8/1/95 Date | **TIME-DOMAIN EM CONDUCTIVITY - IHSS 133** |
| Checked TE7 8/1/95 Date | ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE |
| App oved MRW 10/10/95 D te | OU5 - WOMAN CREEK PRIORITY DRAINAGE |
| | RFI/RI REPORT |
| FILE OU5 2 11 DWG | FIGURE 2-11 |




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- 133.1 — INDIVIDUAL HAZARDOUS SUBSTANCE SITES
- 56993 — LOCATION CODE
- BOREHOLE LOCATION
- WELL LOCATION
- SMALL DIAMETER WELL
- WELL POINT LOCATION

N

0 100 200

SCALE 1 = 200

SOURCE OF DATA: RFEDS

Drawn NAM 9/28/95 Date

Checked [signature] 9/28/95 Date

Appro ed [signature] 9/29/95 Date

File OU5 2 12 DWG

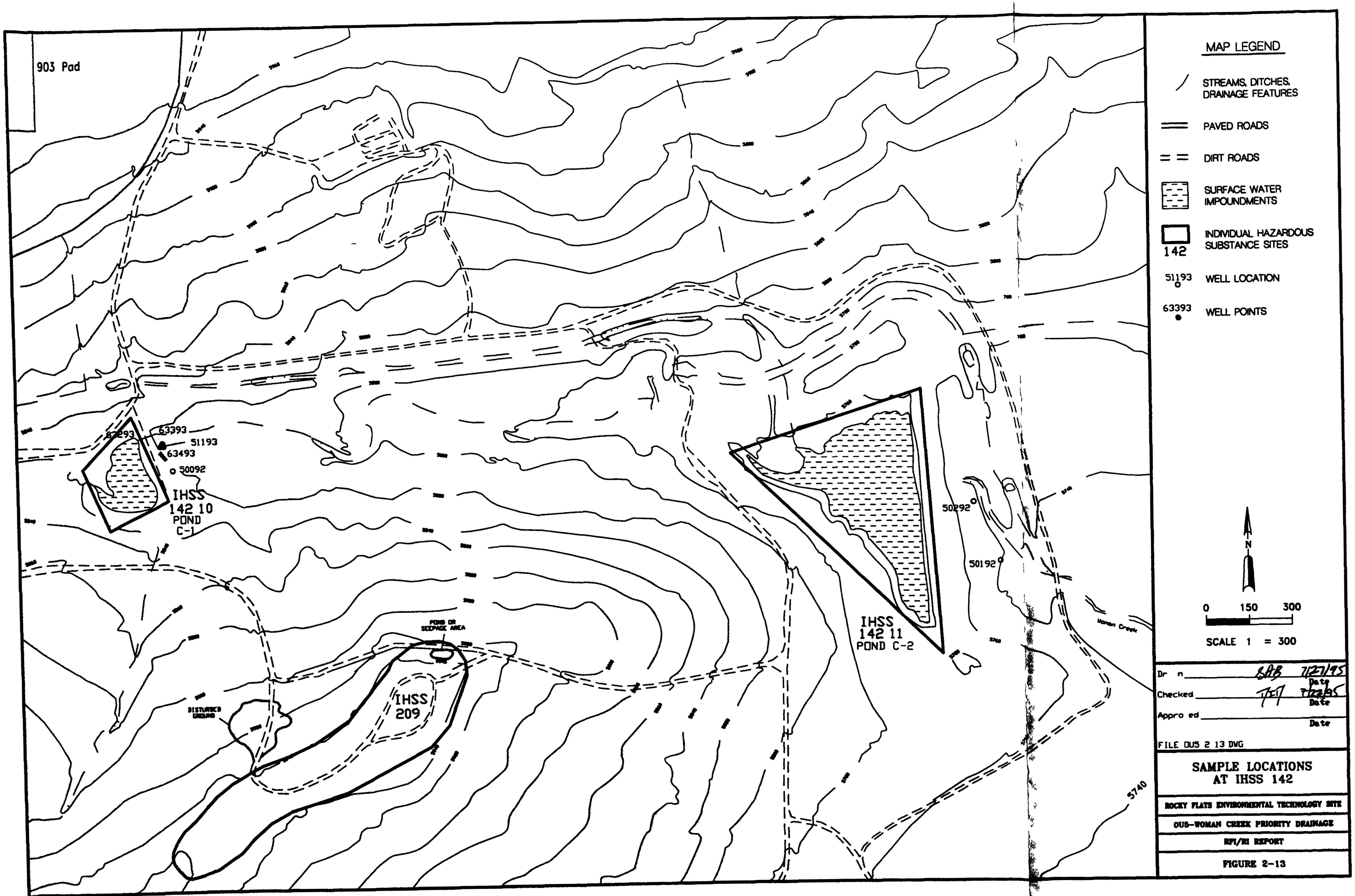
**SAMPLE LOCATION MAP IHSS 133**

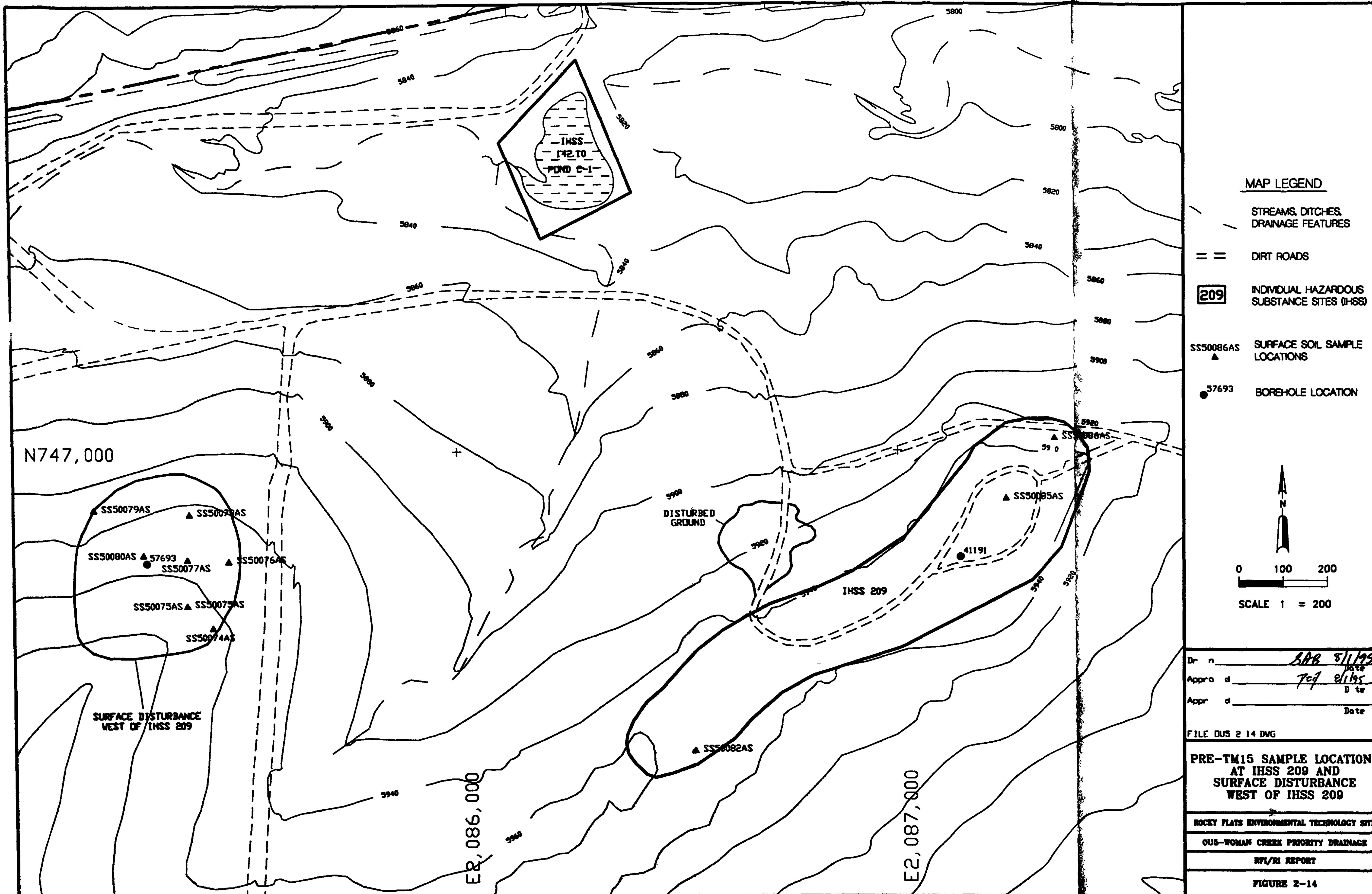
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-12


903 Pad
MAP LEGEND
STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
SURFACE WATER IMPOUNDMENTS
142
INDIVIDUAL HAZARDOUS SUBSTANCE SITES
51193
WELL LOCATION
63393
WELL POINTS
N
0 150 300
SCALE 1 = 300
Dr n SAB 7/27/95 Date
Checked 7/27/95 Date
Appro ed Date
FILE OU5 2 13 DWG
SAMPLE LOCATIONS AT IHSS 142
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 2-13
63293
63393
51193
63493
50092
IHSS 142 10 POND C-1
IHSS 142 11 POND C-2
50292
50192
Woman Creek
POND OR SEEPAGE AREA
IHSS 209
DISTURBED GROUND
5740




Dr n SAB 8/1/95 Date
Appro d TCJ 8/1/95 D te
Appr d Date

FILE OU5 2 14 DWG

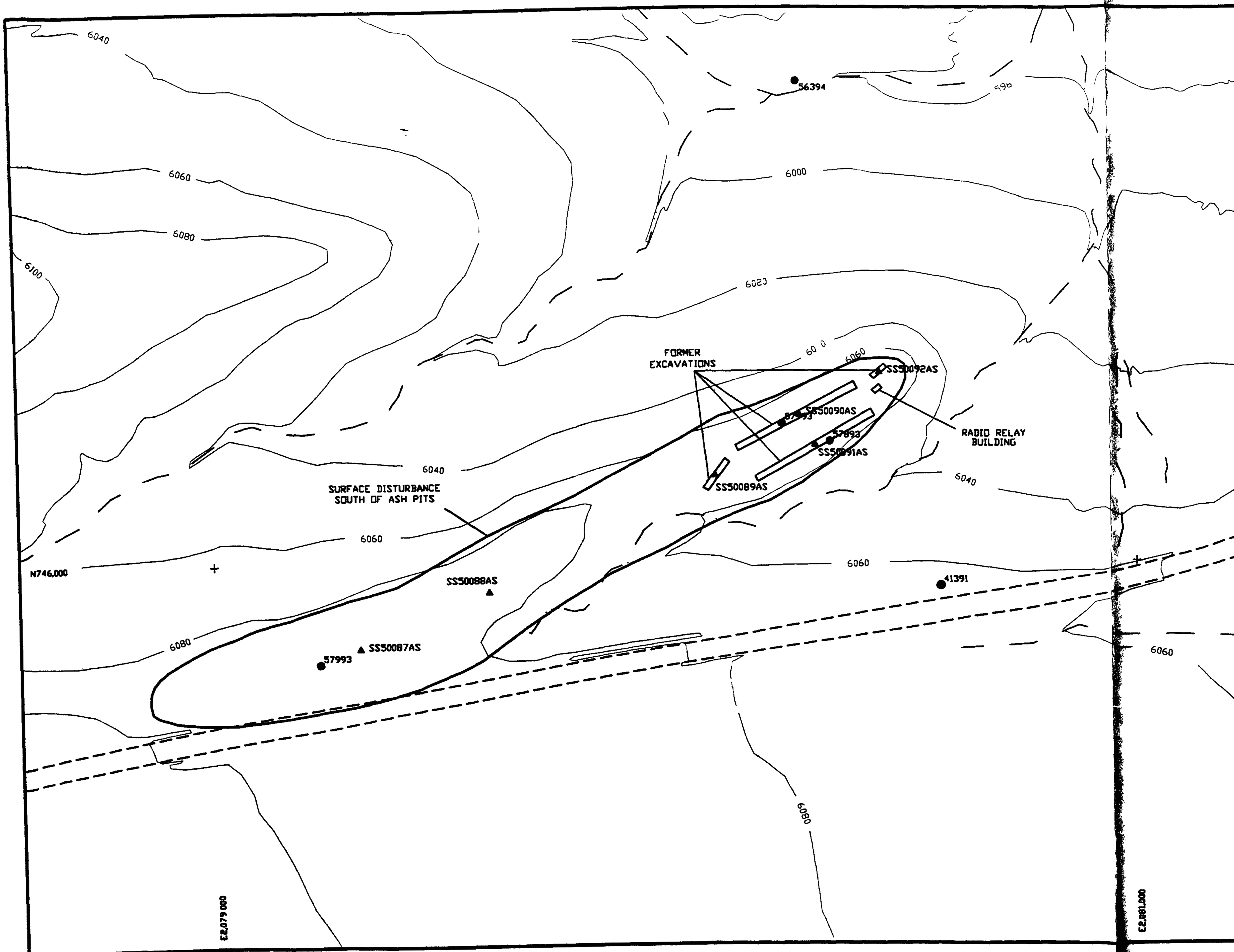
**PRE-TM15 SAMPLE LOCATIONS AT IHSS 209 AND SURFACE DISTURBANCE WEST OF IHSS 209**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-14




MAP LEGEND

| | |
|---|---|
| | STREAMS, DISTCHES, DRAINAGE FEATURES |
| = = | DIRT ROADS |
| 209 | INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSS) |
| SS50089AS ▲ | SURFACE SOIL SAMPLING LOCATION |
| ● 57993 | BOREHOLE LOCATION |

N

0 100 200

SCALE 1 = 200

| | | |
|---|---|---|
| Drn | NAM | 9/28/95 Date |
| Check d | [illegible] | 9/28/95 Date |
| Appro ed | [illegible] | 9/29/95 Date |

FILE OU5 2 15 DWG

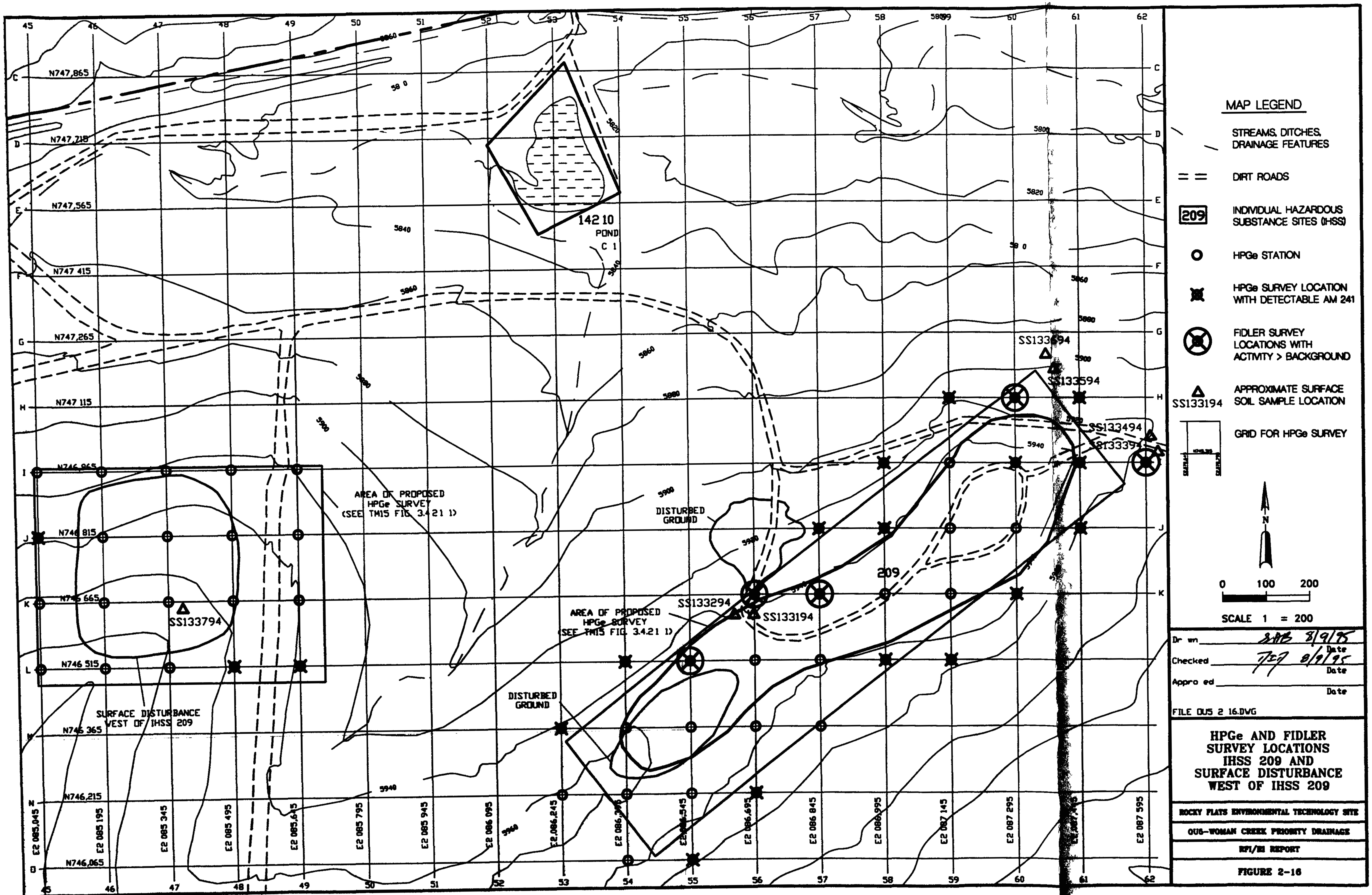
**PRE-TM15 SAMPLE LOCATIONS AT SURFACE DISTURBANCE SOUTH OF THE ASH PITS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-15




Dr wn SAB 8/9/95 Date

Checked TEJ 8/9/95 Date

Appro ed Date

FILE OU5 2 16.DWG

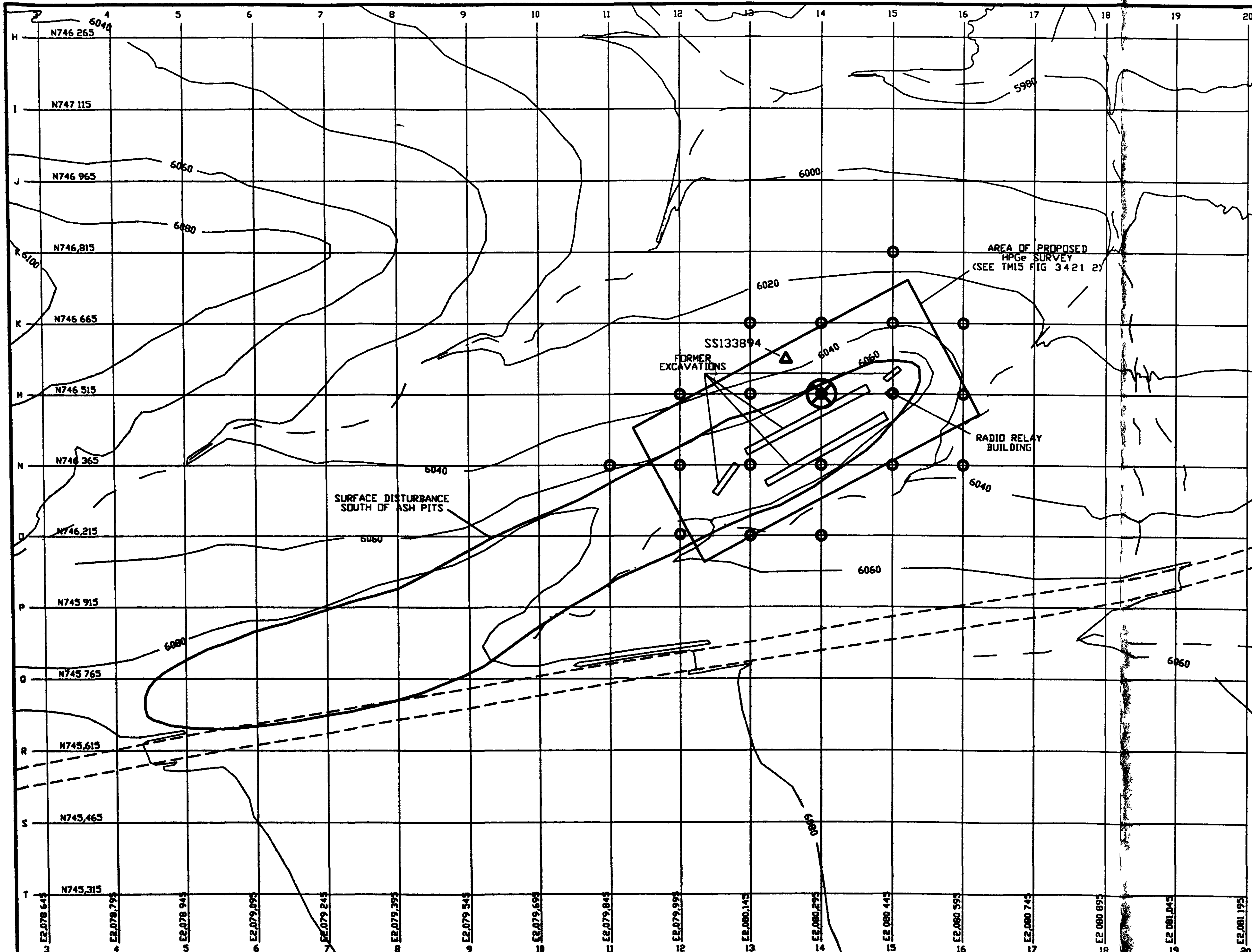
**HPGe AND FIDLER SURVEY LOCATIONS IHSS 209 AND SURFACE DISTURBANCE WEST OF IHSS 209**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-16




MAP LEGEND

STREAMS DITCHES DRAINAGE FEATURES

DIRT ROADS

209 INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSS)

HPGe STATION

HPGe SURVEY LOCATION WITH DETECTABLE AM 241

FIDLER SURVEY LOCATIONS WITH ACTIVITY > BACKGROUND

SS133894 APPROXIMATE SURFACE SOIL SAMPLE LOCATION

GRID FOR HPGe SURVEY

N

0 100 200

SCALE 1 = 200

Dr wn SBB 8/9/95 Date

Che k d TCJ 8/9/95 Date

Appro ed Date

FILE OU5 2 17 DWG

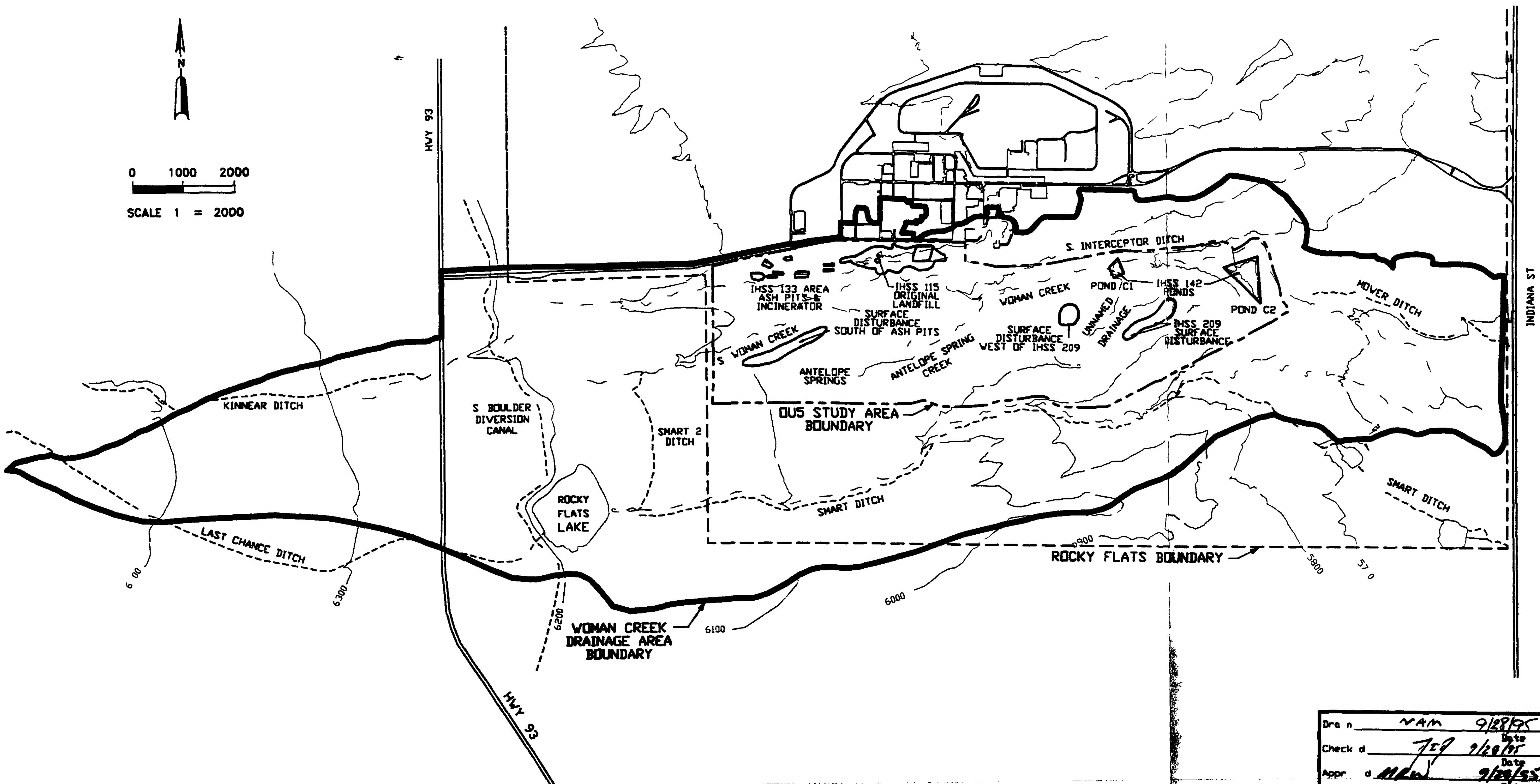
**HPGe AND FIDLER SURVEY LOCATIONS SURFACE DISTURBANCE SOUTH OF THE ASH PITS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 2-17

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|---|---|
| Drawn NAM | 9/28/95 Date |
| Checked TEP | 9/28/95 Date |
| Approved MRW | 9/28/95 Date |
| File OU5 31 | |

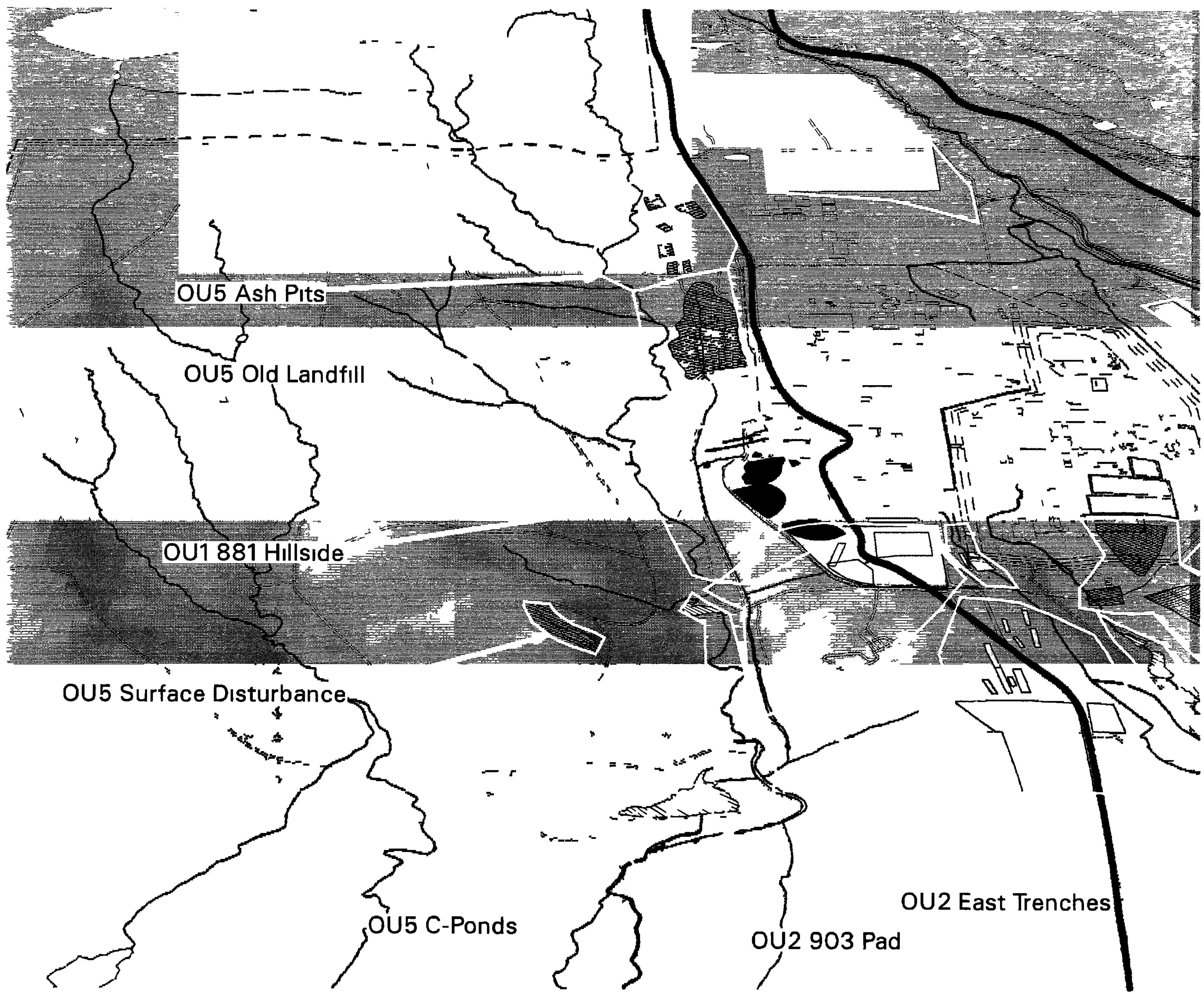
**WOMAN CREEK DRAINAGE**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-1




## EXPLANATION

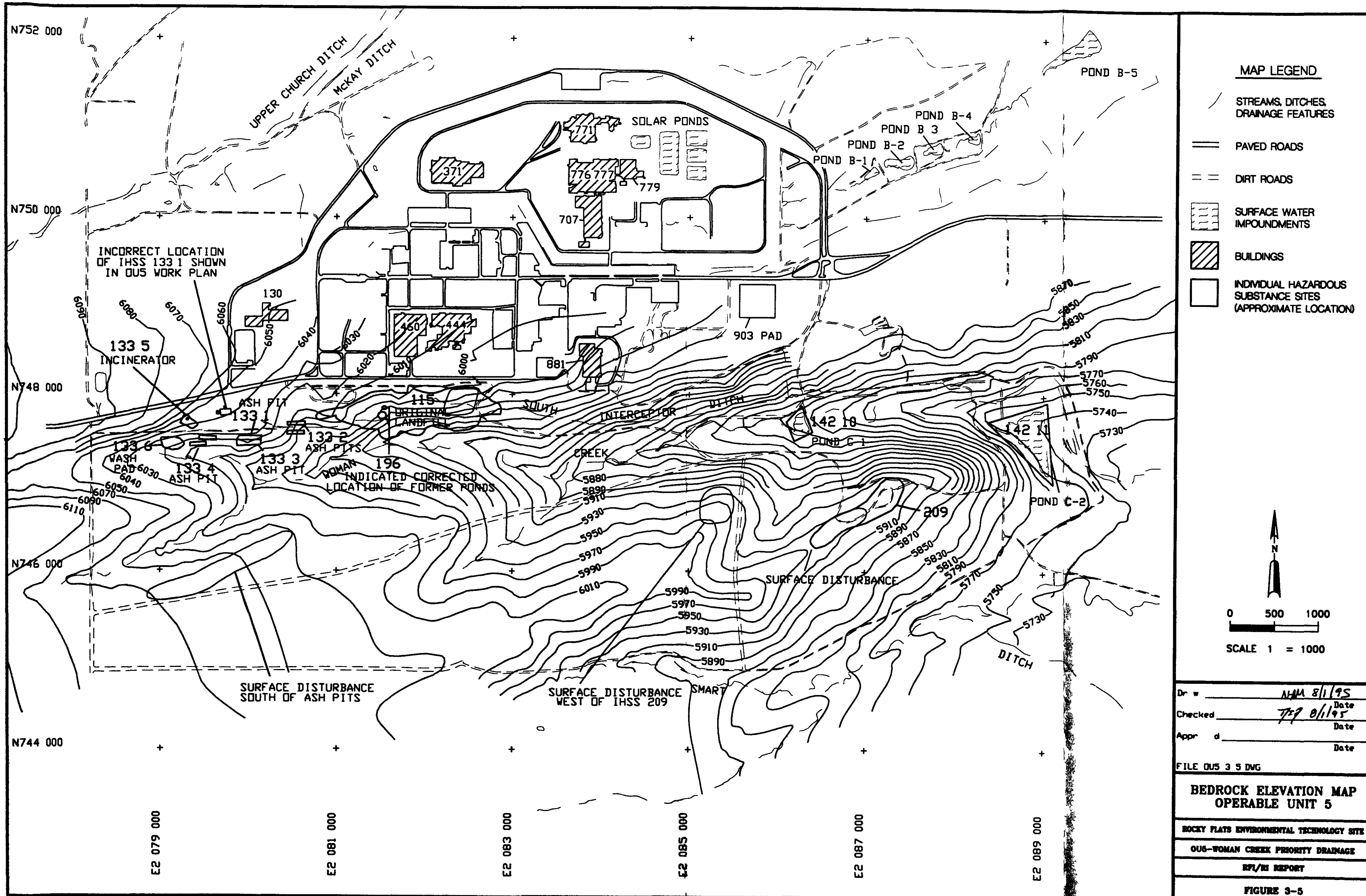
- Watershed Boundary
- Rock Creek Watershed
- Walnut Creek Watershed
- Woman Creek Watershed
- Central Avenue
- Dirt Roads
- Canals and Ditches
- Security Fences
- Rocky Flats Buffer Zone
- Lakes and Ponds
- Buildings
- Operable Unit 1 881 Hillside
- Operable Unit 2 903 Pad Mound and East Trenches
- Operable Unit 4 Solar Ponds
- Operable Unit 5 Woman Creek
- Operable Unit 6 Walnut Creek
- Operable Unit 10 Other Outside Closures
- Operable Unit 11 West Spray Field
- ERA Source Areas

U S Department of Energy
R ky Fl t E v me t l T h l gy St
Golden C l ado

ERA fo Walnut Cr ek d W man C eek
W t h d t RFETS

**ERA Source Areas**
**in**
**Woman Creek Watershed**

| | |
|---|---|
| Septemb r 1995 | F gure 7 2 1 |




Dr w AHM 8/1/95 Date
Checked TJG 8/1/95 Date
Appr d Date
FILE OU5 3 5 DWG

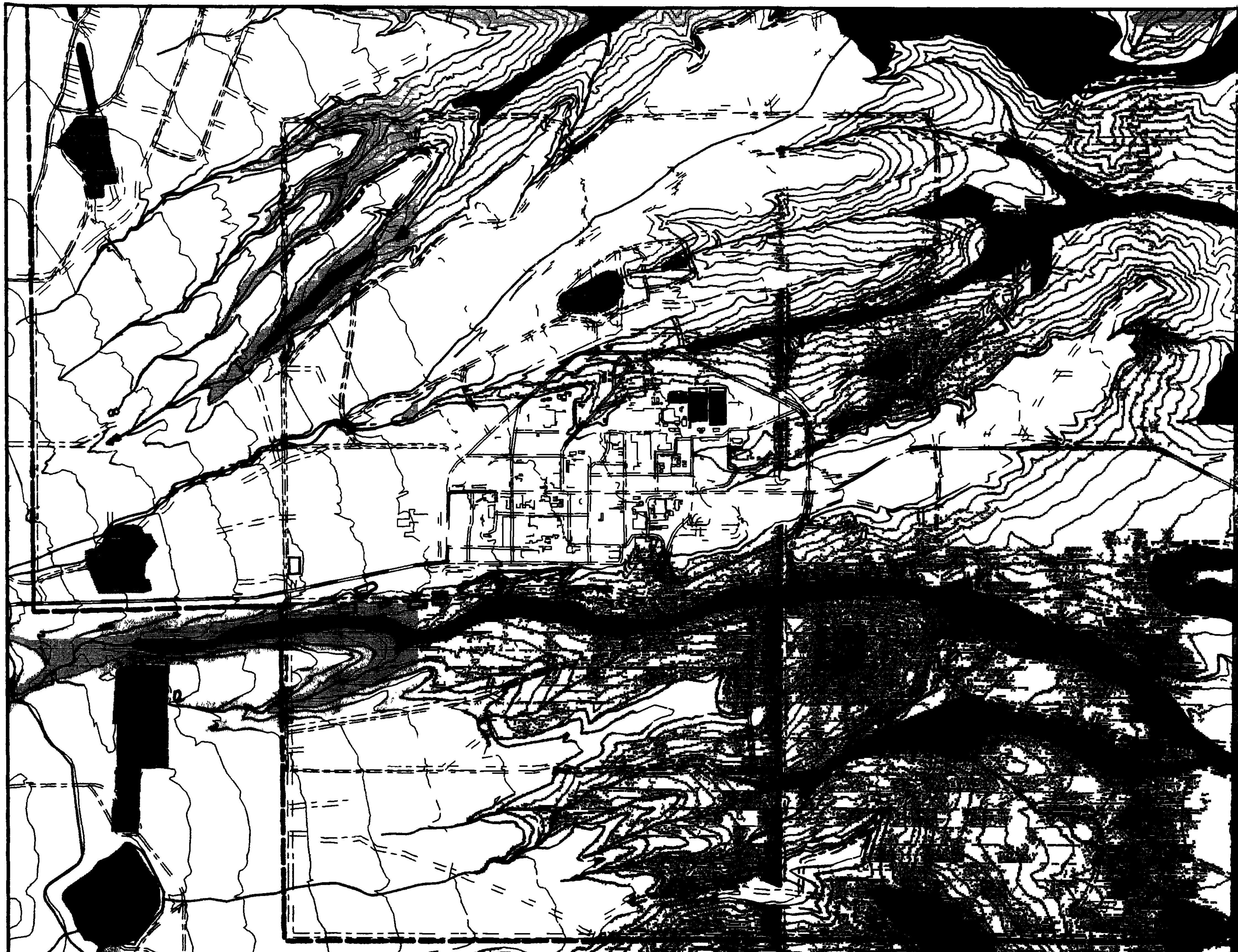
**BEDROCK ELEVATION MAP**
**OPERABLE UNIT 5**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-5



OU5 SURFACE SOILS MAP

- Veldkamp Nederland ery cbly sdy loams
- Flat rons very cbly sdy loam
- Valmont clay loam
- Leyden Pr men Standley cbly clay loams
- De ver Kutch clay loams
- Rock outcrop sed menta y
- M dway clay loam
- P ts gravel
- Denver clay loam
- Englewood clay loam
- Nederland very cobly sdy loam
- Ha erson loam
- Nunn clay loam
- W llowman Leyden cbly loams
- McCla e clay loam
- Water

ROAD CLASSIFICATION

- Heavy Duty
- Medium Duty
- Light Duty
- Unimproved D rt
- Rocky Flats Boundary

Source USDA SCS
Soil Survey of
Golden Area CO
1980

1 6000

N

| | |
|---|---|
| Dr wn NAM | 9/29/95 Dat |
| Che k d TEF | 12/95 Date |
| Appr d RLW | 10/1/95 Dat |

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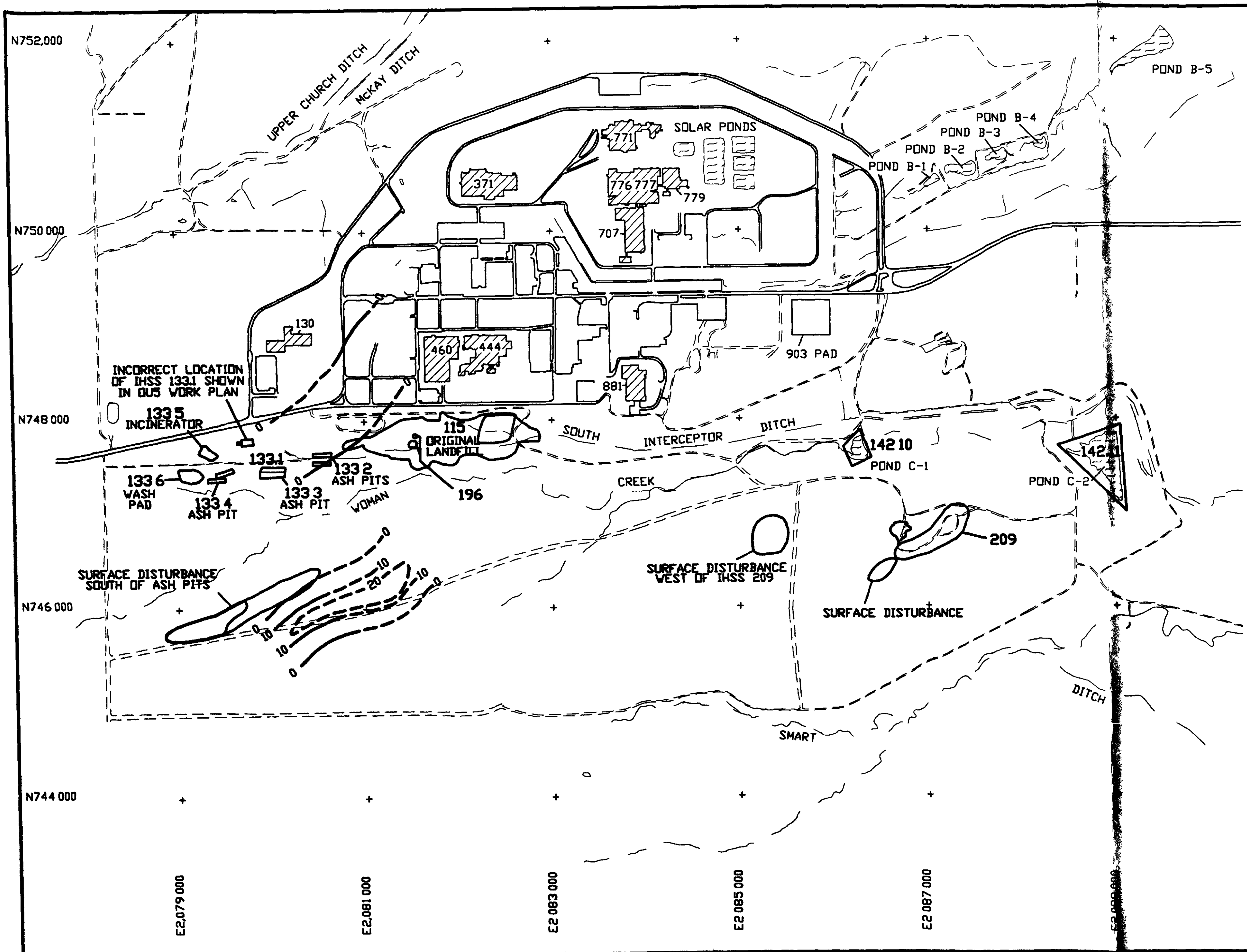
OPERABLE UNIT 5
SURFACE SOIL MAP

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-6




Source: EG&G, 1995a

Dr wn NAH 8/8/95 Date

Appr d TM 8/8/95 Date

Appr ved Date

FILE 5 3 6 DWG

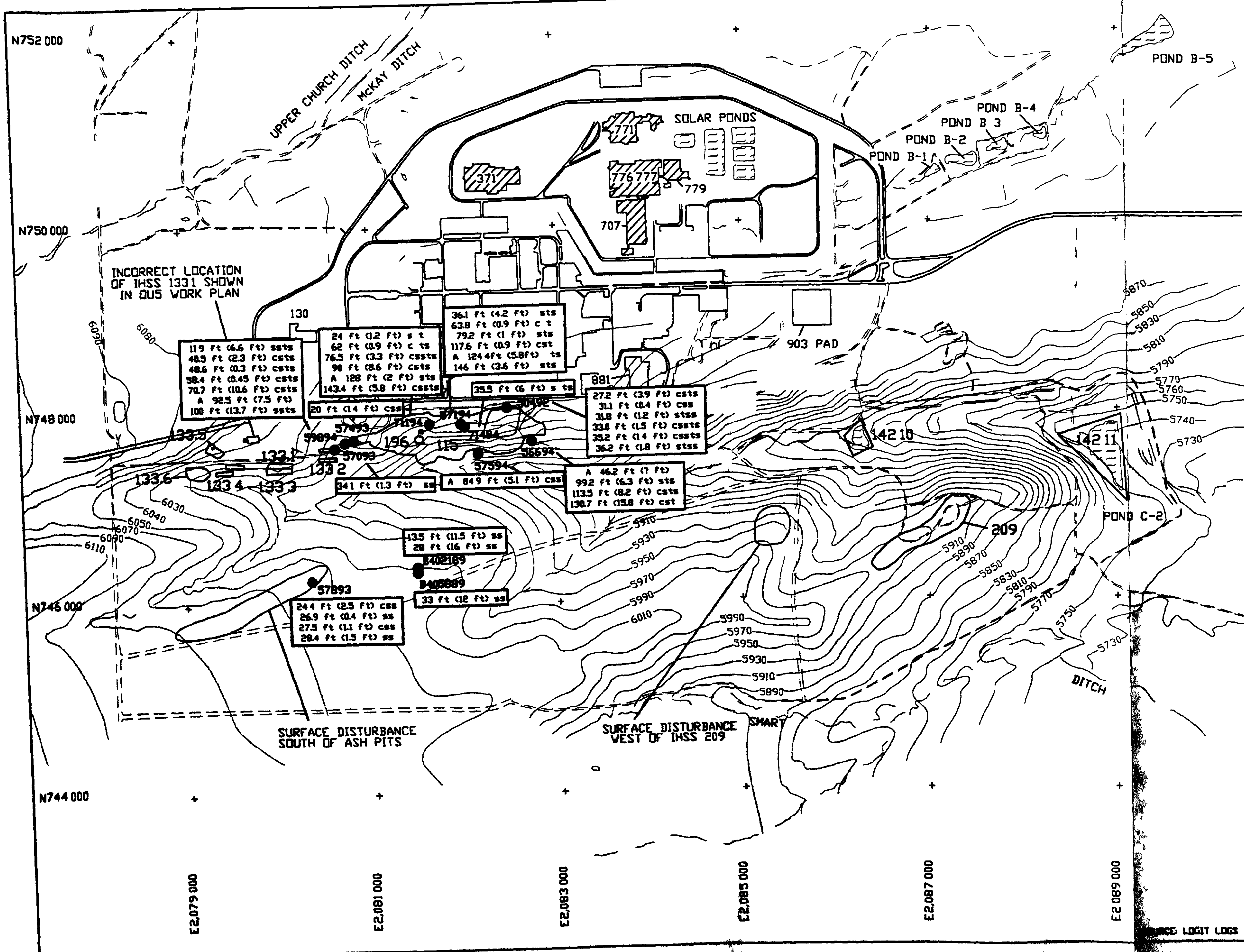
ISOLITH MAP OF ARAPAHOE FORMATION SANDSTONES IN OU5 AREA

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-7




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- SURFACE WATER IMPOUNDMENTS
- BUILDINGS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)
- B405889 BOREHOLE LOCATION

DEPTH TO SANDSTONE/SILTSTONE FROM GROUND SURFACE

35.5 ft (6 ft) sts — LITHOLOGY

THICKNESS OF SANDSTONE/SILTSTONE

| | |
|---|---|
| cs | CLAYEY SANDSTONE |
| c t | CLAYEY SILTSTONE |
| csst | CLAYEY-SANDY SILTSTONE |
| ss | SANDSTONE |
| s ts | SANDY SILTSTONE |
| st | SILTSTONE |
| sts | SILTY SANDSTONE |

N

0 500 1000

SCALE 1 = 1000

| | | |
|---|---|---|
| Drawn | NAM | 10/1/95 Date |
| Checked | TEJ | 10/2/95 Date |
| Approved | MRW | 10/10/95 Date |

FILE 5 3 8.DWG

**LOCATION OF SANDSTONES AND SILTSTONES ENCOUNTERED IN AND ADJACENT TO OU5**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-8

SOURCE: LOGIT LOGS


# LEGEND

## SURFICIAL DEPOSITS

RECENT
PLEISTOCENE AND RECENT
PLEISTOCENE
QUATERNARY

## BEDROCK

UPPER CRETACEOUS
CRETACEOUS

## MAP SYMBOLS

### ROAD CLASSIFICATION

Heavy Duty
Med um Duty
L ght Duty
Un mproved D rt
Rocky Flats Boundary
IHSS Boundar es

Source Geolog c Character zation Report by EG&G March 1995

1 6000

D SAB 8/9/95
C k TEP 8/9/95
MRW 9/29/95

ILE OU5 3 9 DWG D L

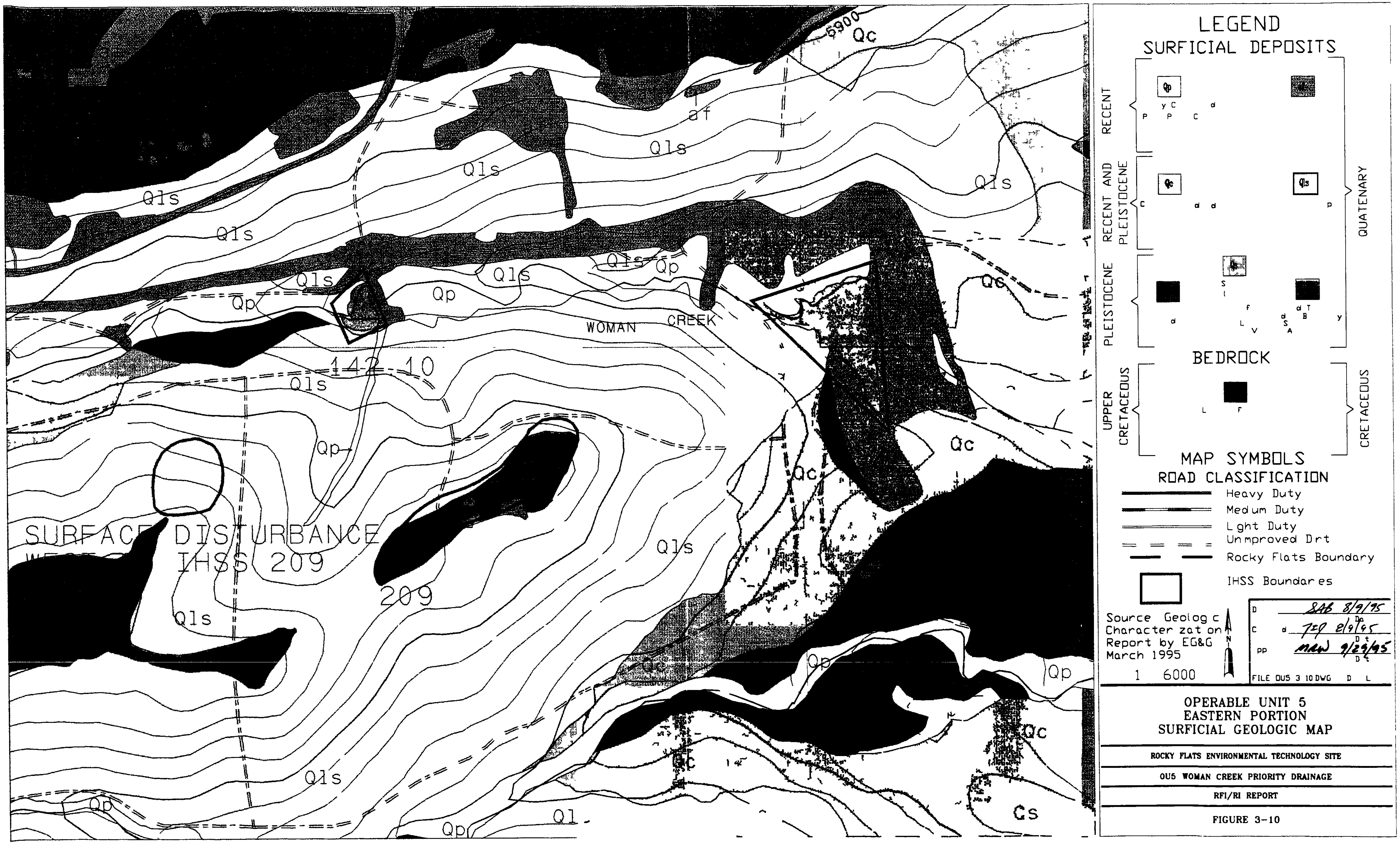
OPERABLE UNIT 5
WESTERN PORTION
SURFICIAL GEOLOGIC MAP

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

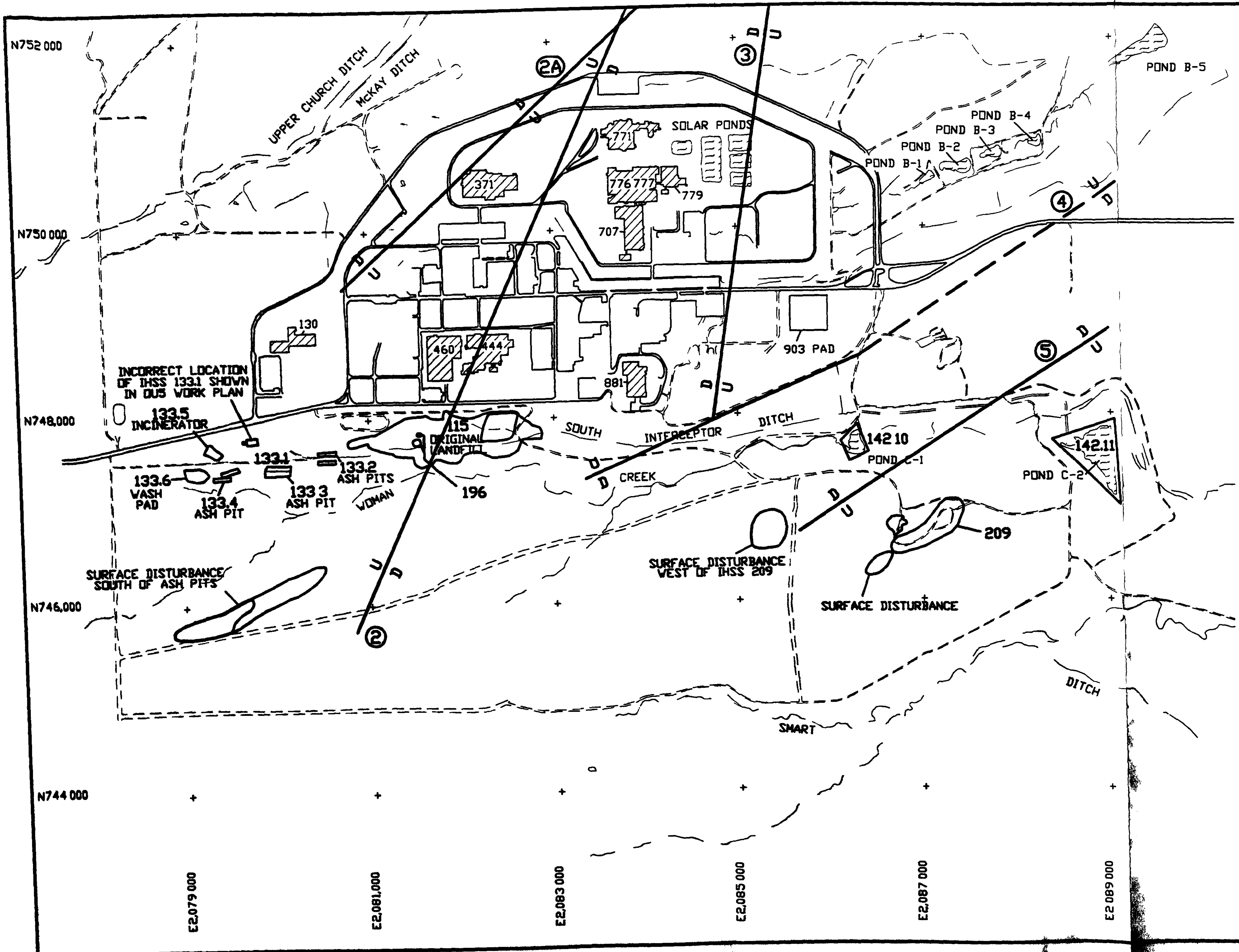
OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3 9



6900
Qc
af
Qls
Qp
WOMAN
CREEK
142
10
SURFACE DISTURBANCE
IHSS 209
209
Ql
Cs
LEGEND
SURFICIAL DEPOSITS
RECENT
RECENT AND PLEISTOCENE
PLEISTOCENE
QUATENARY
BEDROCK
UPPER CRETACEOUS
CRETACEOUS
MAP SYMBOLS
ROAD CLASSIFICATION
Heavy Duty
Medium Duty
Light Duty
Unimproved Dirt
Rocky Flats Boundary
IHSS Boundaries
Source Geologic Characterization Report by EG&G March 1995
1 6000
N
SAB 8/9/95
TEP 8/9/95
MAW 9/29/95
FILE OU5 3 10.DWG
OPERABLE UNIT 5
EASTERN PORTION
SURFICIAL GEOLOGIC MAP
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5 WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 3-10




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

SURFACE WATER IMPOUNDMENTS

BUILDINGS

INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)

POSSIBLE OR INFERRED FAULT DASHED WHERE LOCATION IN UNCERTAIN

U UP THROWN BLOCK

D DOWN THROWN BLOCK

5 FAULT NUMBER REFERENCED IN TEXT

N

0 500 1000

SCALE 1 = 1000

Source: EG&G 1995a GEOLOGIC CHARACTERIZATION REPORT FOR ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

| | | |
|---|---|---|
| Drawn | NAM | 9/28/95 Date |
| Approved | [signature] | 9/29/95 Date |
| Approved | [signature] | 9/29/95 Date |

FILE 5 3 6.DWG

**INFERRED FAULTS IN OU5 AREA**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-11

## Vegetation Types Identified in Woman Creek Watershed in Vicinity of OU5 IHSSs

**Figure 3-12**

### Vegetation Types

- An ual g ass/fo b
- D sturbed/bar en lands
- Developed areas
- Short g ass
- Mes c m ed g assland
- Xe c m ed grassland
- Recla med m ed g ass
- Sens t ve hab tats
- Bottomland shrub
- Upland shrub short
- Upland shrub tall
- Upland shrub short
- Wet meadow/marsh ecotone
- Short marsh
- Tall marsh
- Open water
- Dec duous woodland
- Ponderosa woodland
- Tree plantings
- Ponderosa woodland
- Tree plantings
- OU5 IHSSs
- Ou5 Surface D sturbance

### Standard Map Features

- Bu ld ngs o other structures
- Lakes and ponds
- Streams d tches o other dra nage features
- Fences
- Rocky Flats boundary
- Paved roads
- D rt roads

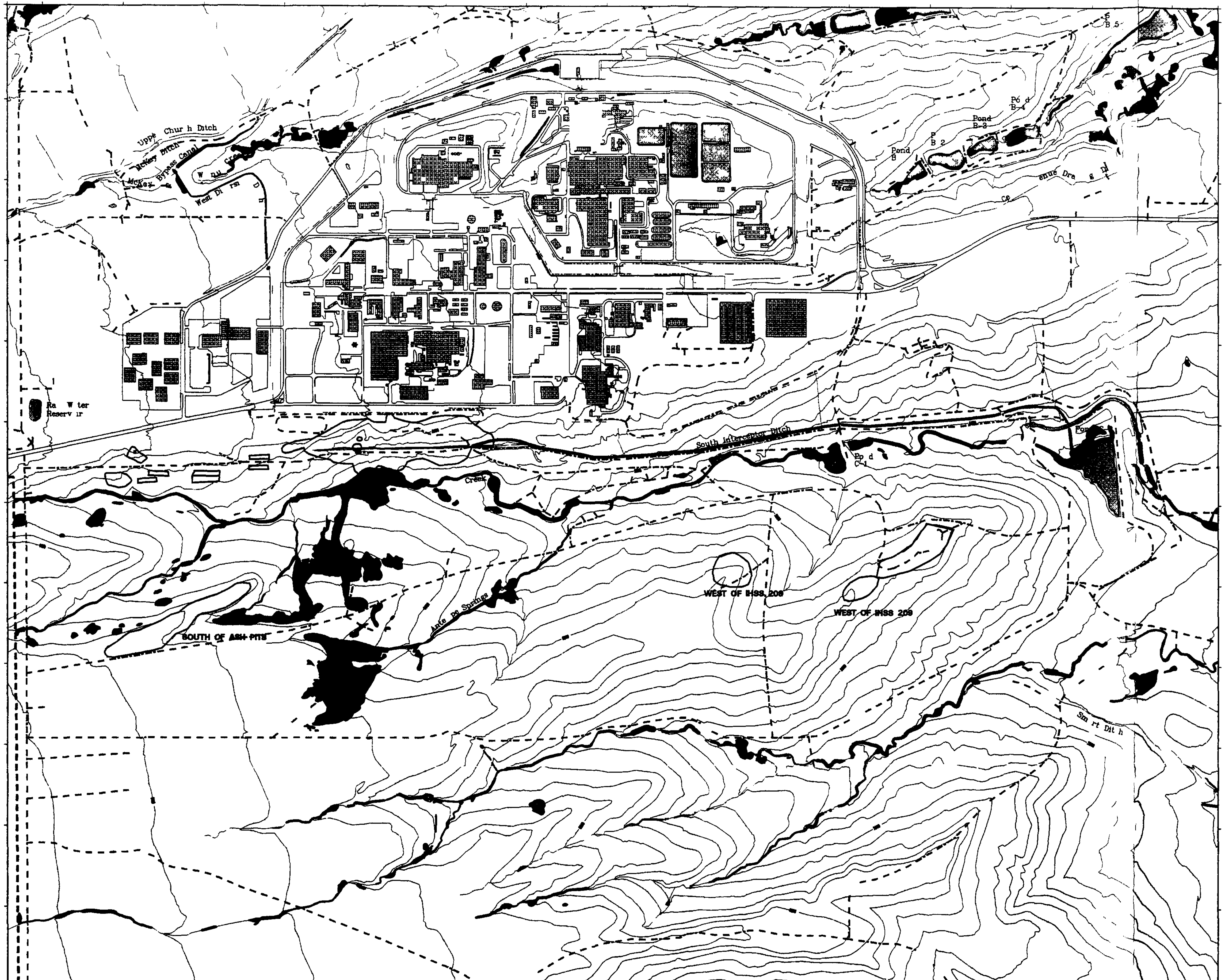
DATA SOURCE.
Building roads an fences provided by
Facilities Engr
G& Rocky Flats, Inc.
Hydrolog provided by
USGS date unknown)
The vegetation ata from Ebasco AutoCAD DXF file which was generate using aerial photos and digitizing hand drawn field maps.
Ebasco 993

Scale 2000
inch represents 000 feet

50 0 500 100

State Plane Coordinate Projection
Colorado Central one
Datum: NAD

U S Department of Energy
Rocky Flats Environmental Technology Site
MAP ID: fig-3- 2
August 07, 1995




**Wetlands Identified in Woman Creek Watershed in Vicinity of OU5 IHSSs**

**Figure 3-13**

- Wetlands
- OU5 IHSSs
- Ou5 Surface Disturbance

**Standard Map Features**

- Buildings or other structures
- Lakes and ponds
- Streams ditches or other drainage features
- Fences
- Contours (20 Intervals)
- Rocky Flats boundary
- Paved roads
- Dirt roads

*DATA SOURCE:*
*Wetlands data surveyed, compiled, and assembled by the U.S. Army Corps of Engineers; 1994.*
*Buildings, roads, and fences provided by Facilities Engr EG&G Rocky Flats, Inc. 89*
*Hydrology provided by USGS (date unknown)*

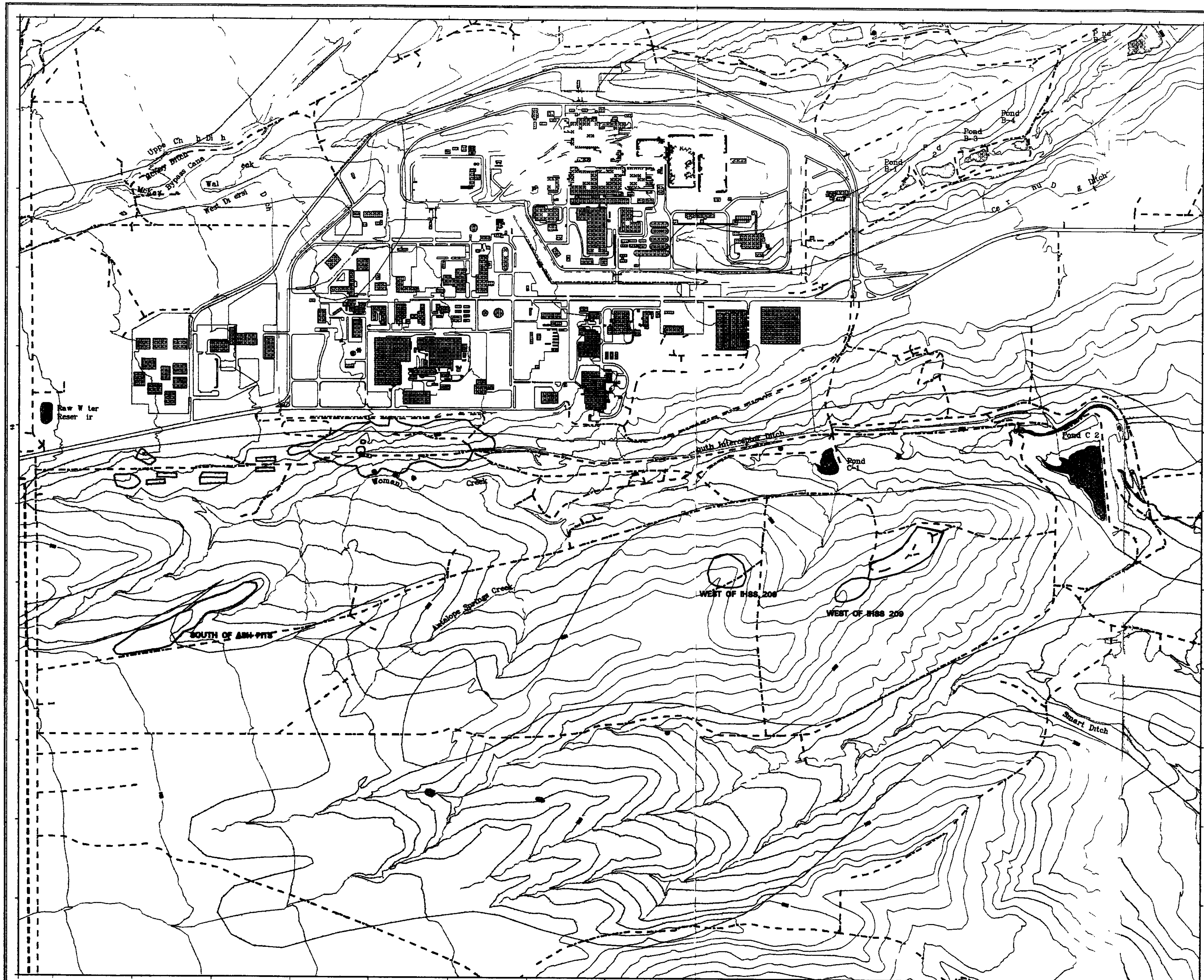
Scale 2000
1 inch represents 1000 feet

0 500 1000 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

MAP ID: 95-8-18 August 07, 1995




# Capture Locations and Probable Range of Preble s Meadow Jumping Mouse in OU5 Vicinity

## Figure 3-14

- Probable Range
- Records of (PMJM) (Zapus hudsonius preblei)
- OU5 IHSSs
- Ou5 Surface Disturbance

**Standard Map Features**

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Contours (20 Intervals)
- Rocky Flats boundary
- Paved roads
- Dirt roads

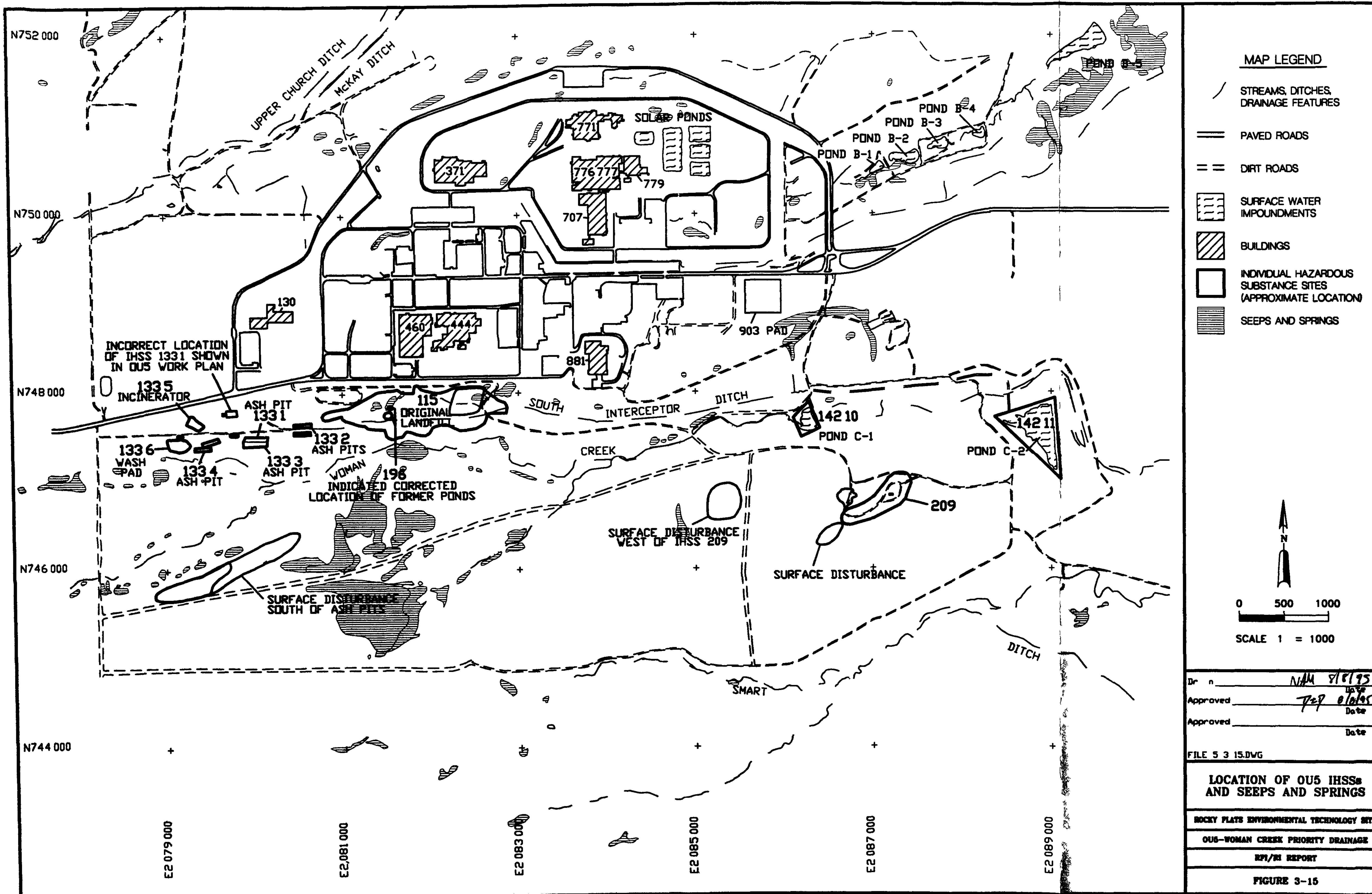
*DATA SOURCE:*
*Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991*
*Hydrology provided by USGS (date unknown)*
*Records of Preble' Meadow Jumping Mouse Probable Range, provided by Alison Deans of EP/EWM 1994.*

Scale 2000
Inch represents 1000 feet

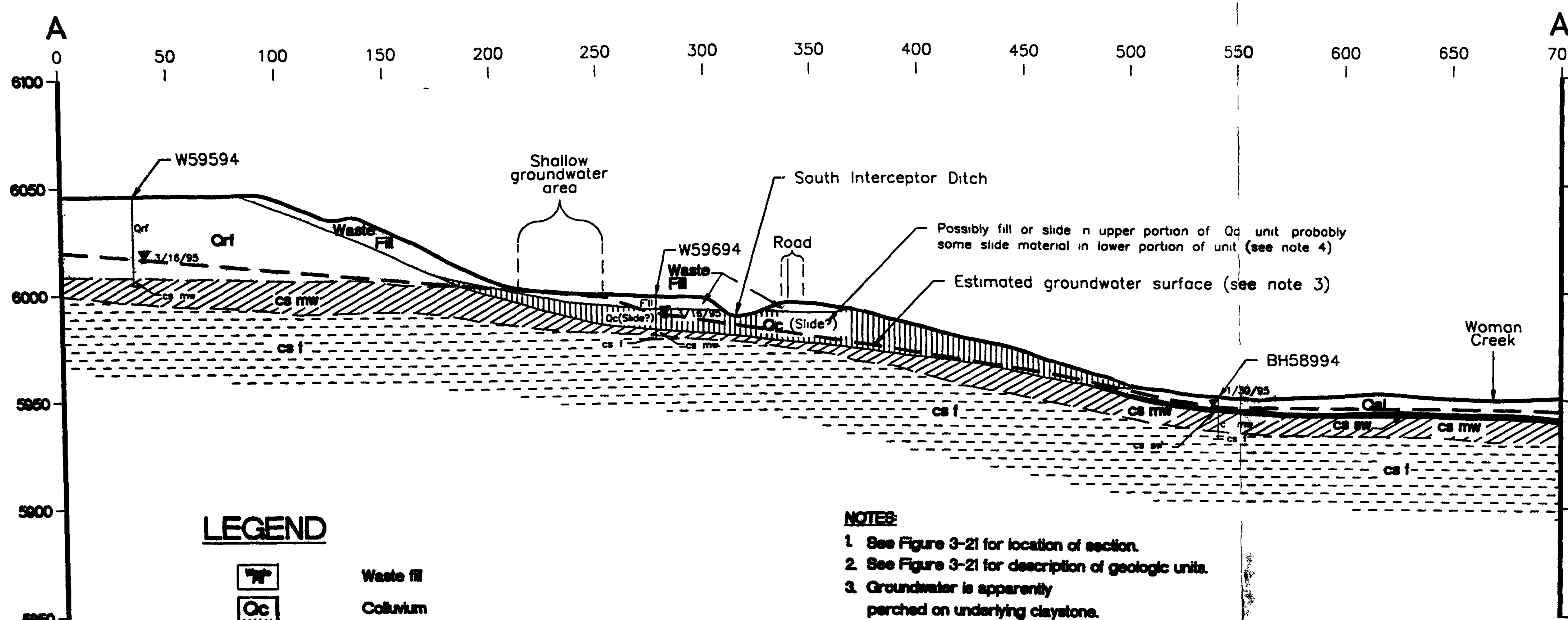
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

MAP ID: fig-3-14 August 07, 1995



N752 000
N750 000
N748 000
N746 000
N744 000
E2 079 000
E2,081 000
E2 083 000
E2 085 000
E2 087 000
E2 089 000
UPPER CHURCH DITCH
McKAY DITCH
SOLAR PONDS
771
371
776 777
779
707
130
460
444
881
903 PAD
POND B-1
POND B-2
POND B-3
POND B-4
POND B-5
INCORRECT LOCATION OF IHSS 1331 SHOWN IN OU5 WORK PLAN
133 5 INCINERATOR
ASH PIT 133 1
133 2 ASH PITS
133 3 ASH PIT
133 4 ASH PIT
133 6 WASH PAD
115 ORIGINAL LANDFILL
196 INDICATED CORRECTED LOCATION OF FORMER PONDS
SOUTH INTERCEPTOR DITCH
WOMAN CREEK
142 10
POND C-1
142 11
POND C-2
209
SURFACE DISTURBANCE WEST OF IHSS 209
SURFACE DISTURBANCE
SURFACE DISTURBANCE SOUTH OF ASH PITS
SMART DITCH
MAP LEGEND
STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
SURFACE WATER IMPOUNDMENTS
BUILDINGS
INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)
SEEPS AND SPRINGS
N
0 500 1000
SCALE 1 = 1000
Dr n NAM 8/8/95 Date
Approved TEP 8/10/95 Date
Approved Date
FILE 5 3 15.DWG
LOCATION OF OU5 IHSSs AND SEEPS AND SPRINGS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 3-15




# LEGEND

| | |
|---|---|
| Waste Fill | Waste fill |
| Qc | Colluvium |
| Qal | Valley Fill Alluvium |
| Qrf | Rocky Flats Alluvium |
| cs | Laramie Formation Claystone: sw = severely weathered; mw = moderately weathered; f = fresh |
| W59694 (Qc, 3/16/95, cs mw) | Geotechnical boring with monitoring well, showing geologic units, groundwater elevation and date measured. |
| BH58994 (1/30/95, Qal, cs sw) | Geotechnical boring, backfilled, showing geologic units, groundwater elevation and date encountered. |

NOTES:

1. See Figure 3-21 for location of section.
2. See Figure 3-21 for description of geologic units.
3. Groundwater is apparently perched on underlying claystone.
4. Interpretation of the unit shown as Qc on this section is tentative and based on materials encountered in W59694. the location of pre-landfill ground surface along this section is needed to more confidently interpret origin of these materials.

50 0 50

SCALE IN FEET

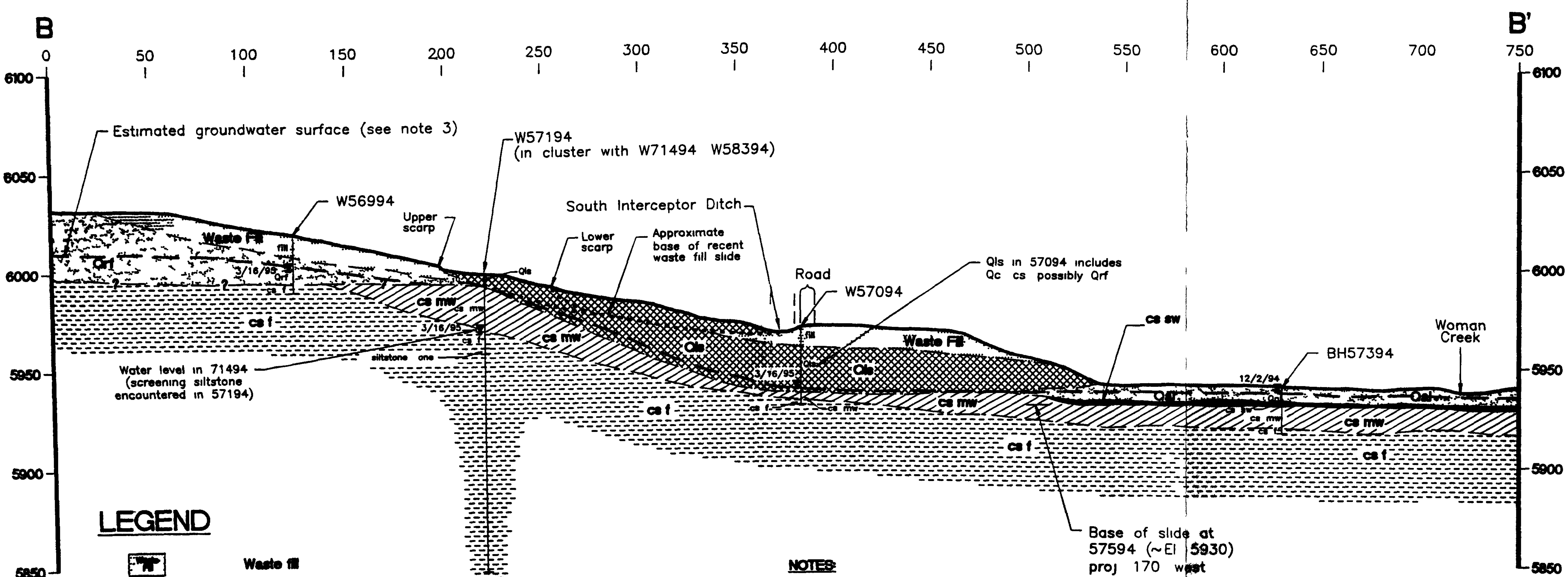
SOURCE: EG&G, 1995a: PRELIMINARY ROCKY FLATS TECHNOLOGY SITE GEOTECHNICAL INVESTIGATION (DRAFT)

Drawn NAM 9/28/95 Date
Checked 9/29/95 Date
Approved 9/29/95 Date

FILE OU5-3-17.DWG

GEOLOGIC CROSS SECTION A-A
IHSS 115/196

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 3-17




## LEGEND

Waste fill

Qls — Landslide Deposits (unit may contain material from several discrete landslides)

Qal — Valley Fill Alluvium

Qrf — Rocky Flats Alluvium

cs — Laramie Formation Claystone: sw = severely weathered
mw = moderately weathered
f = fresh

W57094 (Qls, 3/16/95, cs mw) — Geotechnical boring, with monitoring well, showing geologic units, groundwater elevation and date measured.

BH57394 (12/2/94, Qal, cs sw) — Geotechnical boring, backfilled, showing geologic units, groundwater elevation and date encountered.

NOTES:

1. See Figure 3-21 for location of section.
2. See Figure 3-21 for description of geologic units.
3. Groundwater is apparently perched on underlying claystone.

50 0 50

SCALE IN FEET

SOURCE: EG&G, 1995e: PRELIMINARY ROCKY FLATS TECHNOLOGY SITE GEOTECHNICAL INVESTIGATION (DRAFT)

| | |
|---|---|
| Drawn NAM | 9/28/95 Date |
| Checked [signature] | 9/28/95 Date |
| Approved [signature] | 9/29/95 Date |

FILE 5-3-18.DWG

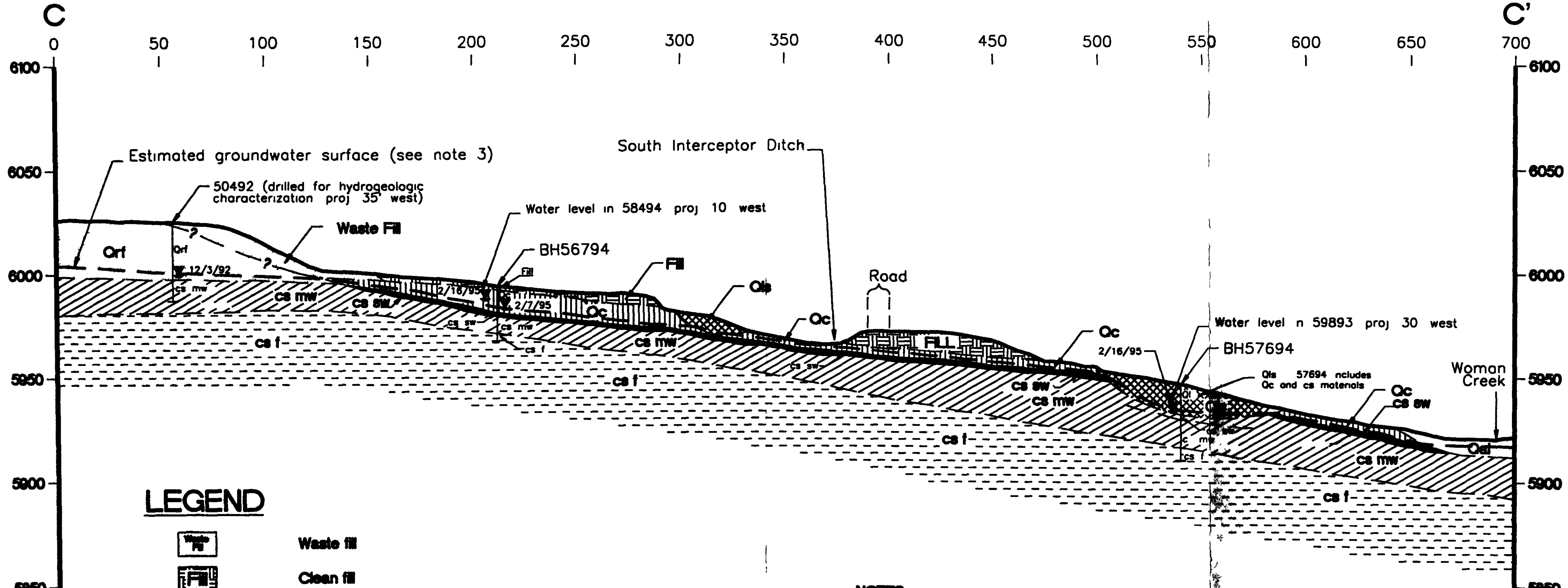
GEOLOGIC CROSS SECTION B-B IHSS 115/196

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

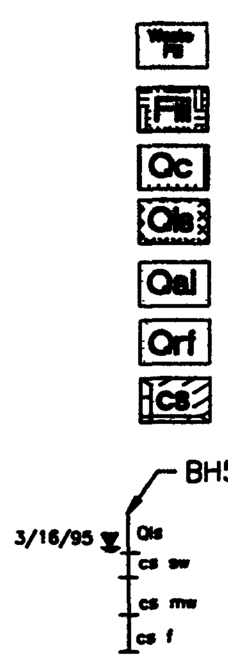
OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-18




## LEGEND




Waste fill

Clean fill

Colluvium

Landslide Deposits (unit may contain material from several discrete landslides)

Valley Fill Alluvium

Rocky Flats Alluvium

Laramie Formation Claystone:
sw = severely weathered
mw = moderately weathered
f = fresh

Geotechnical boring, backfilled, showing geologic units, groundwater elevation and date encountered.

NOTES:

1. See Figure 3-21 for location of section.
2. See Figure 3-21 for description of geologic units.
3. Groundwater is apparently perched on underlying claystone.

50 0 50

SCALE IN FEET

SOURCE: EG&G, 1995a: PRELIMINARY ROCKY FLATS TECHNOLOGY SITE GEOTECHNICAL INVESTIGATION (DRAFT)

| | |
|---|---|
| Drawn NAM | 9/28/95 Date |
| Checked | 9/28/95 Date |
| Approved MRW | 9/29/95 Date |

FILE OU5-3-19 DWG

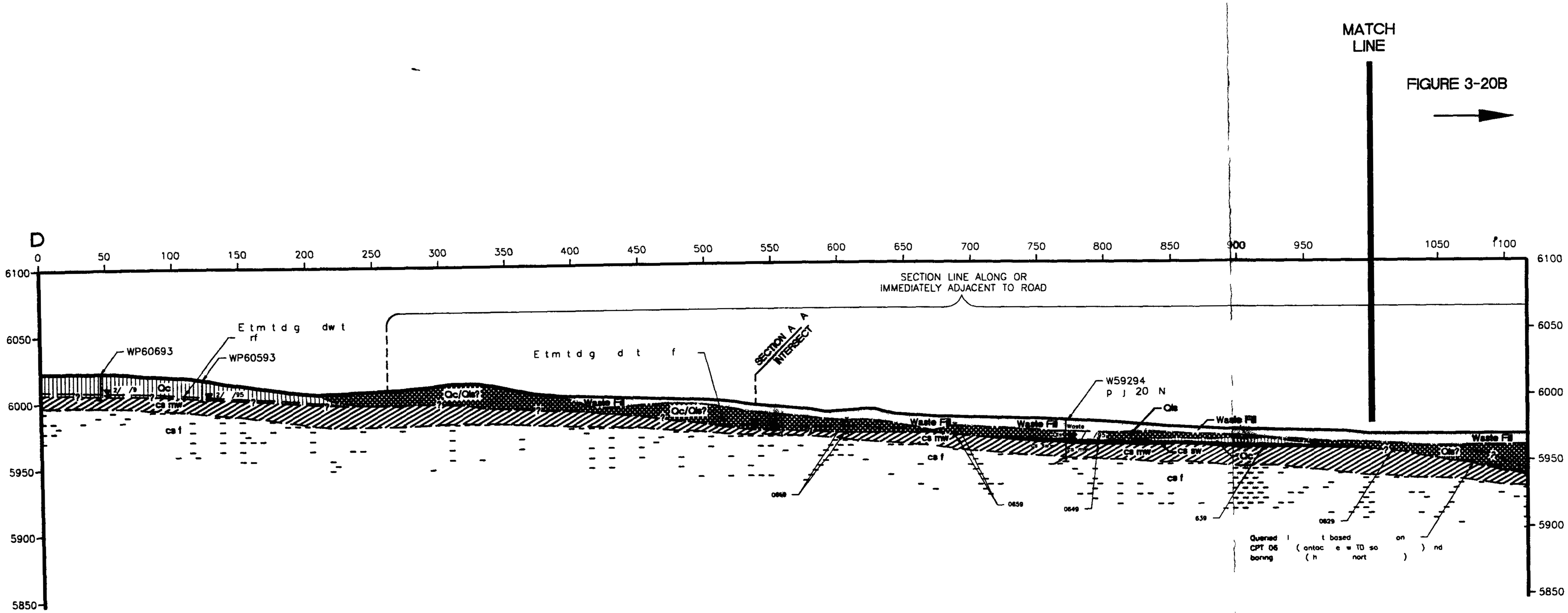
GEOLOGIC CROSS SECTION C-C IHSS 115/196

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-19




NOTES:
1. See Figure 3-21 for location of section.
2. See Figure 3-21 for description of geologic units.
3. Geologic contacts from projected exploration locations are adjusted to assumed elevation along line of section.

## LEGEND

- WF — Waste fill: road fill probably including some waste material
- Fill — Clean road fill
- Fill — Waste fill, clean fill, undifferentiated
- Qc — Colluvium
- Qls — Landslide Deposits (unit may contain material from several discrete landslides)
- cs — Claystone: sw severely weathered; mw moderately weathered; f fresh

- W57094 — Geotechnical boring with monitoring well, showing geologic units, groundwater elevation, and date measured.
- BH57494 — Geotechnical boring, backfilled, showing geologic units: groundwater not encountered.
- 06393 — Interpreted geologic contact based on projected CPT (Cone Penetration Test) with sounding number
- WP60693 — Well point installed for hydrogeologic characterization, showing groundwater elevation and date measured.

80 0 80
SCALE IN FEET

SOURCE: EG&G, 1995a: PRELIMINARY ROCKY FLATS TECHNOLOGY SITE GEOTECHNICAL INVESTIGATION (DRAFT)

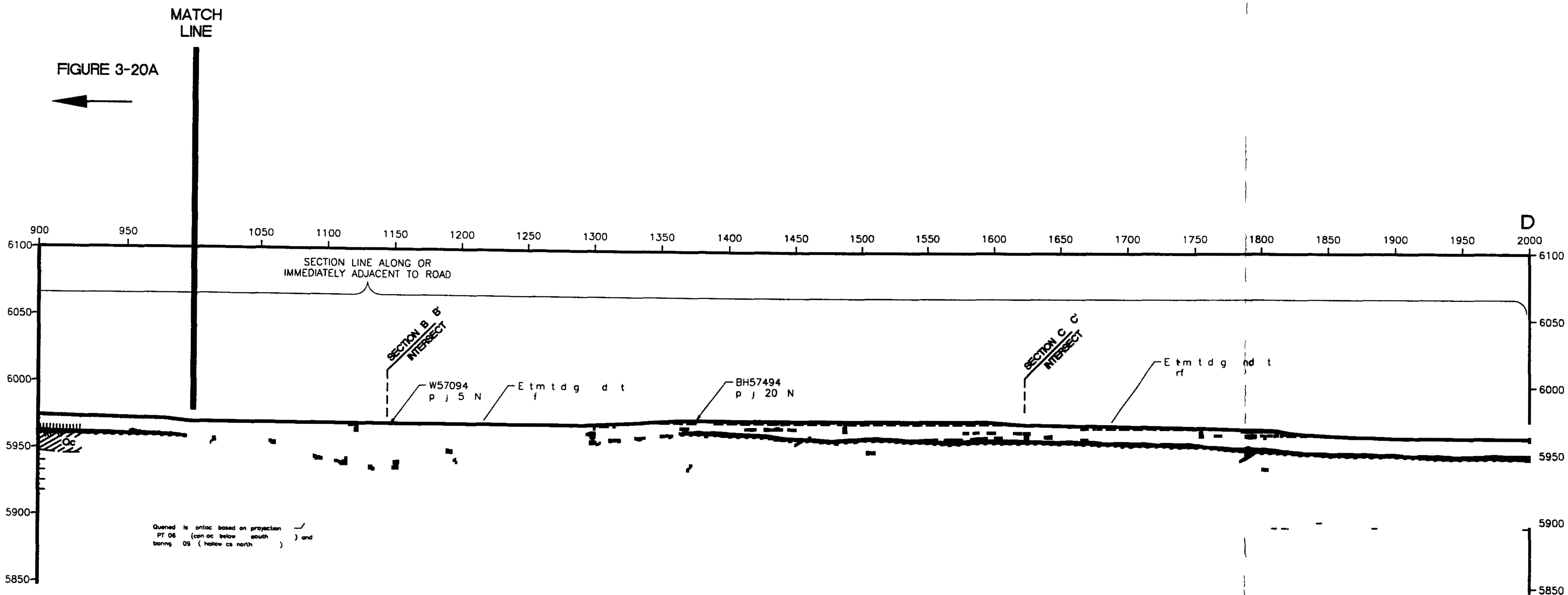
| | |
|---|---|
| Drawn NAM | 9/28/95 Date |
| Checked | 9/28/95 Date |
| Approved MRW | 9/29/95 Date |

FILE 5-3-20A.DWG

**GEOLOGIC CROSS SECTION D-D IHSS 115/196**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT

FIGURE 3-20A




NOTES:
1. See Figur 3-21 for location of section.
2. See Figure 3-21 for description of geologic units.
3. Geologic contacts from projected exploration locations are adjusted to assumed elevation along line of section.

## LEGEND

- Waste fill: road fill probably including some waste material
- Clean road fill
- Waste fill, clean fill, undifferentiated
- Colluvium
- Landslide Deposits (unit may contain material from several descrete landslides)
- Claystone: sw severely weathered; mw moderately weathered; f fresh

- W57094 — Geotechnical boring with monitoring well, showing geologic units, groundwater elevation, and date measured.
- BH57494 — Geotechnical boring, backfilled, showing geologic units: groundwater not encountered.
- 0639 — Interpreted geologic contact based on projected CPT (Cone Penetration Test) with sounding number
- WP60693 — Well point installed for hydrogeologic characterization, showing groundwater elevation and date measured.

80 0 80
SCALE IN FEET

SOURCE EG&G, 1995a PRELIMINARY ROCKY FLATS TECHNOLOGY SITE GEOTECHNICAL INVESTIGATION (DRAFT)

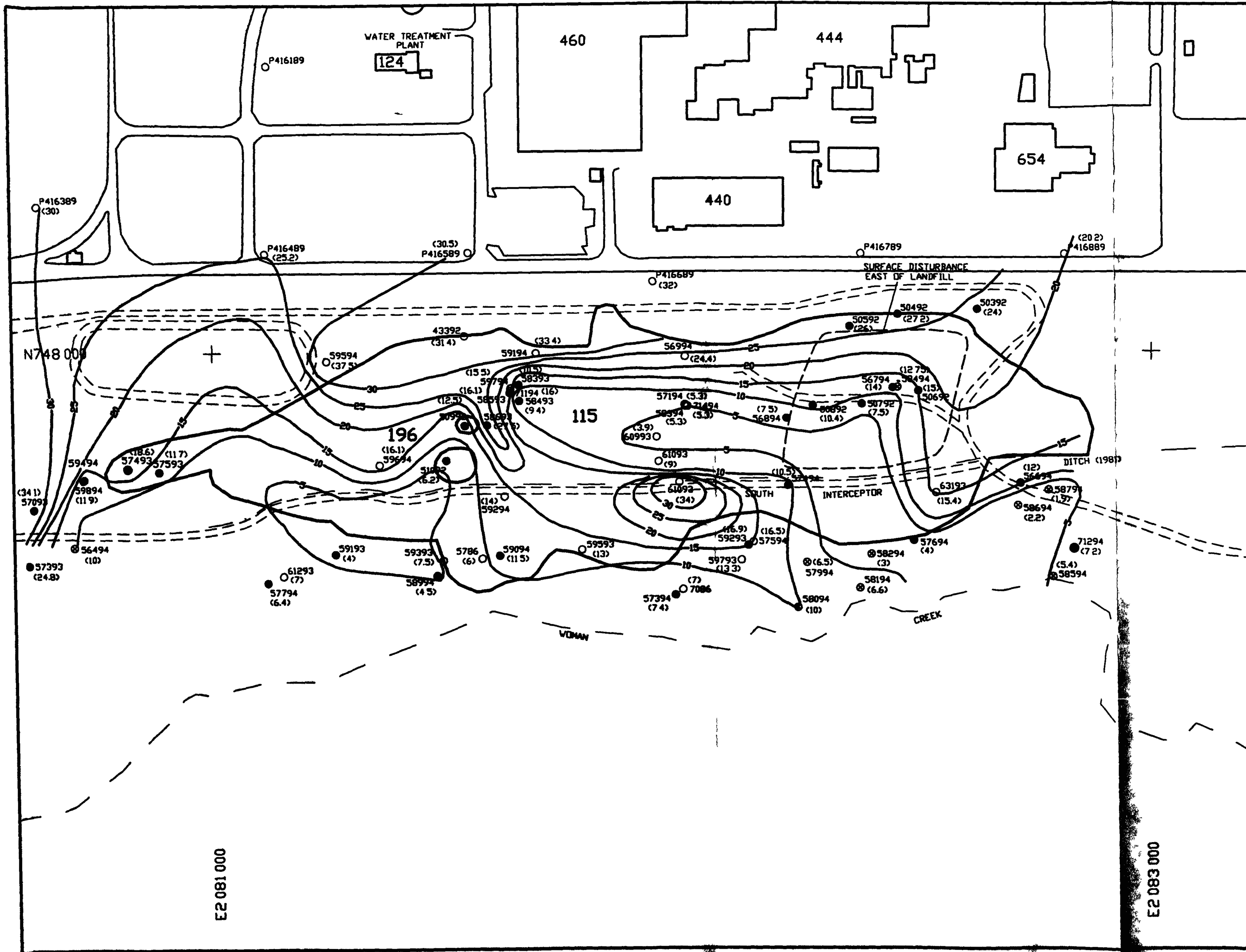
| | | |
|---|---|---|
| Dr wn | NAM | 9/28/95 Date |
| Checked | TLP | 9/28/95 Date |
| Approved | MRW | 9/29/95 Date |

FILE 5-3-20B.DWG

**GEOLOGIC CROSS SECTION D-D IHSS 115/196**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT

**FIGURE 3-20B**




Drawn NAM 9/29/95 Date
Check d TE7 10/1/95 Date
Approved MRW 10/10/95 Date

FILE OU5 3 16.DWG

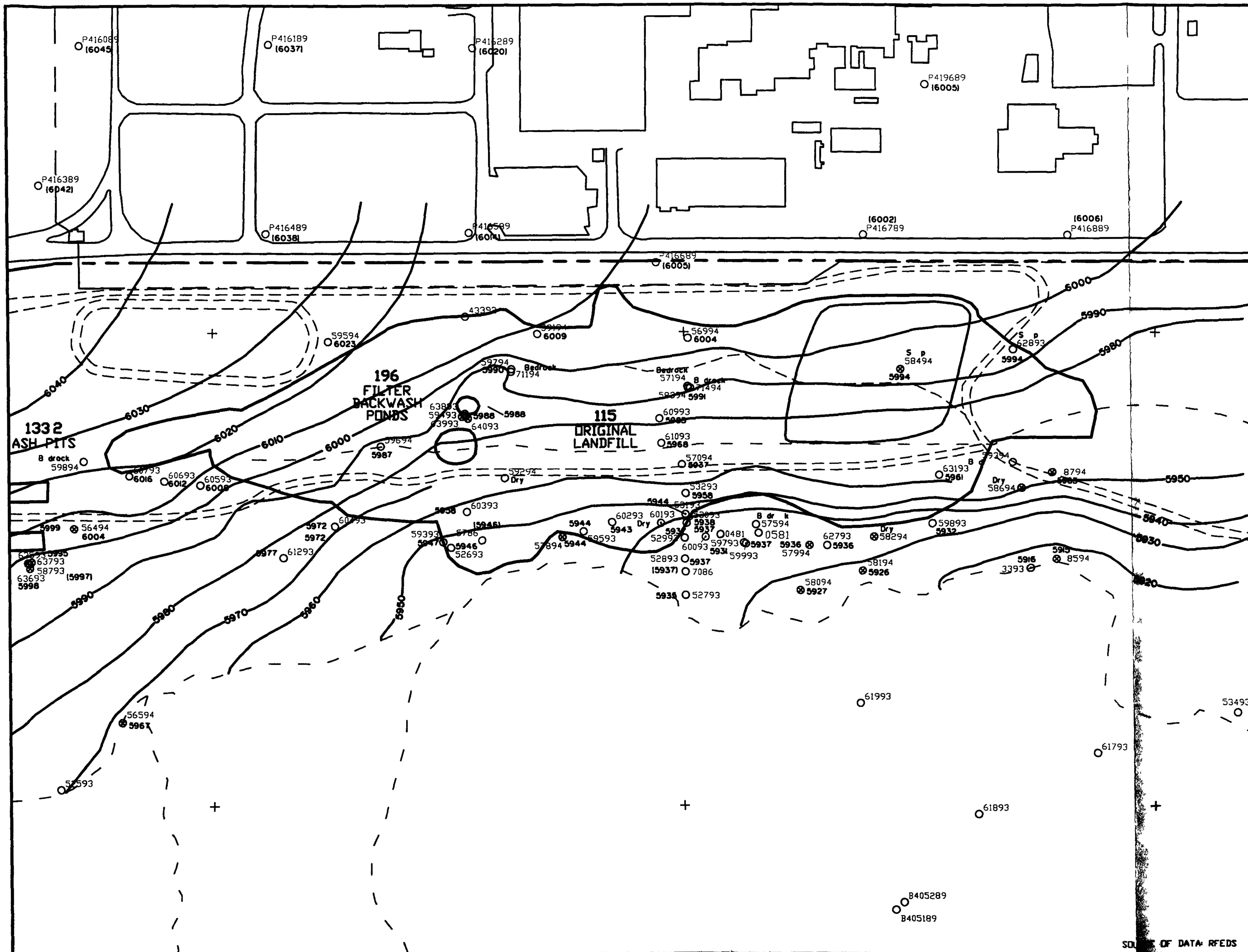
**UNCONSOLIDATED MATERIALS ISOPACH MAP IHSS 115/196**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-21




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)

WATER LEVEL CONTOUR

58694 LOCATION CODE

5961 WATER LEVEL ELEVATION

WELL

WELLPOINT

SMALL DIAMETER WELL

N

0 100 200

SCALE 1 = 200

| | | |
|---|---|---|
| Dr NAM | 9/28/95 | Date |
| Checked TEA | 9/28/95 | Date |
| Approved MRW | 9/29/95 | Date |

Fi 5 3 24

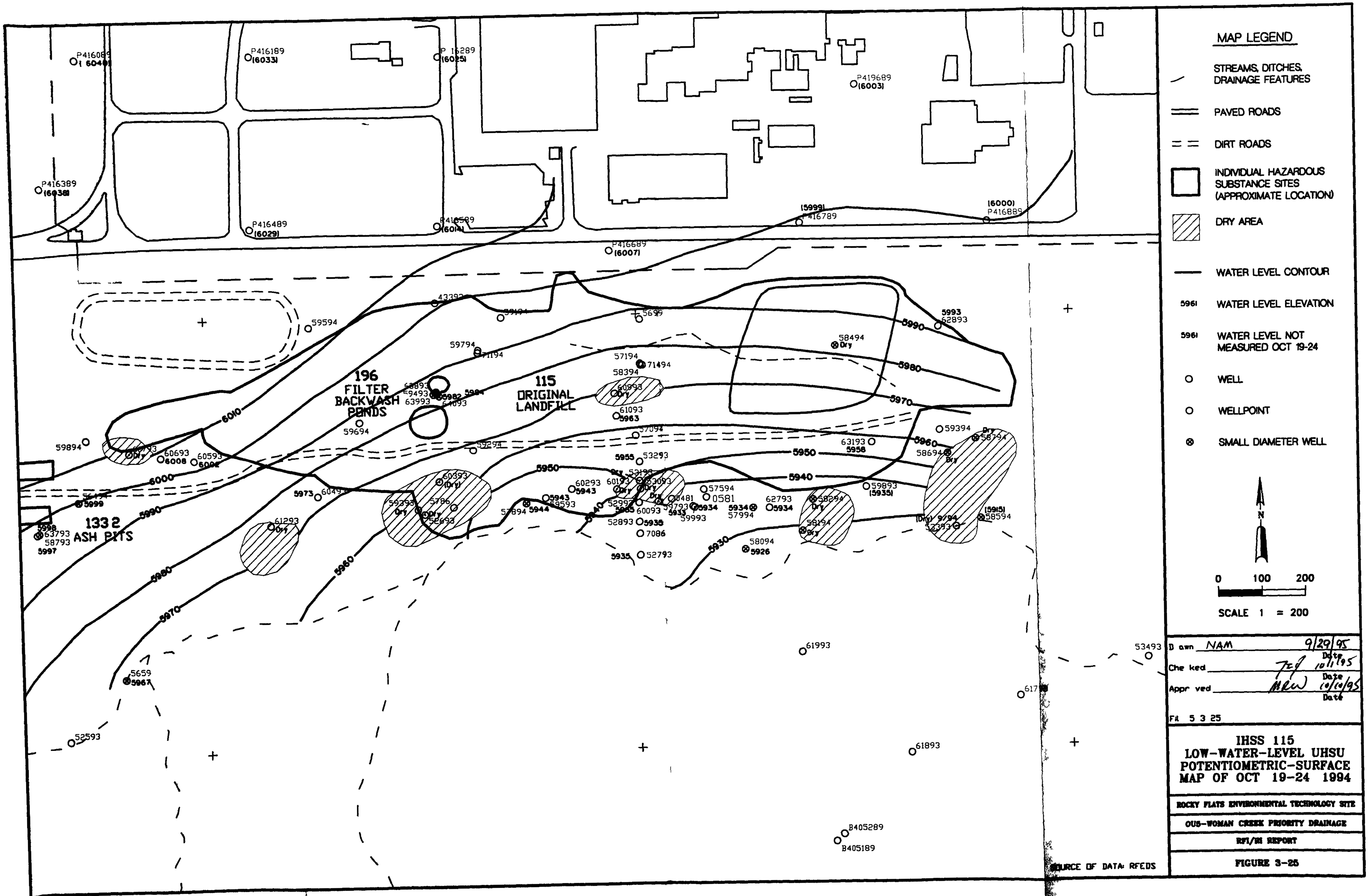
**IHSS 115**
**HIGH-WATER-LEVEL UHSU**
**POTENTIOMETRIC-SURFACE**
**MAP OF MAY 16-19 1995**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

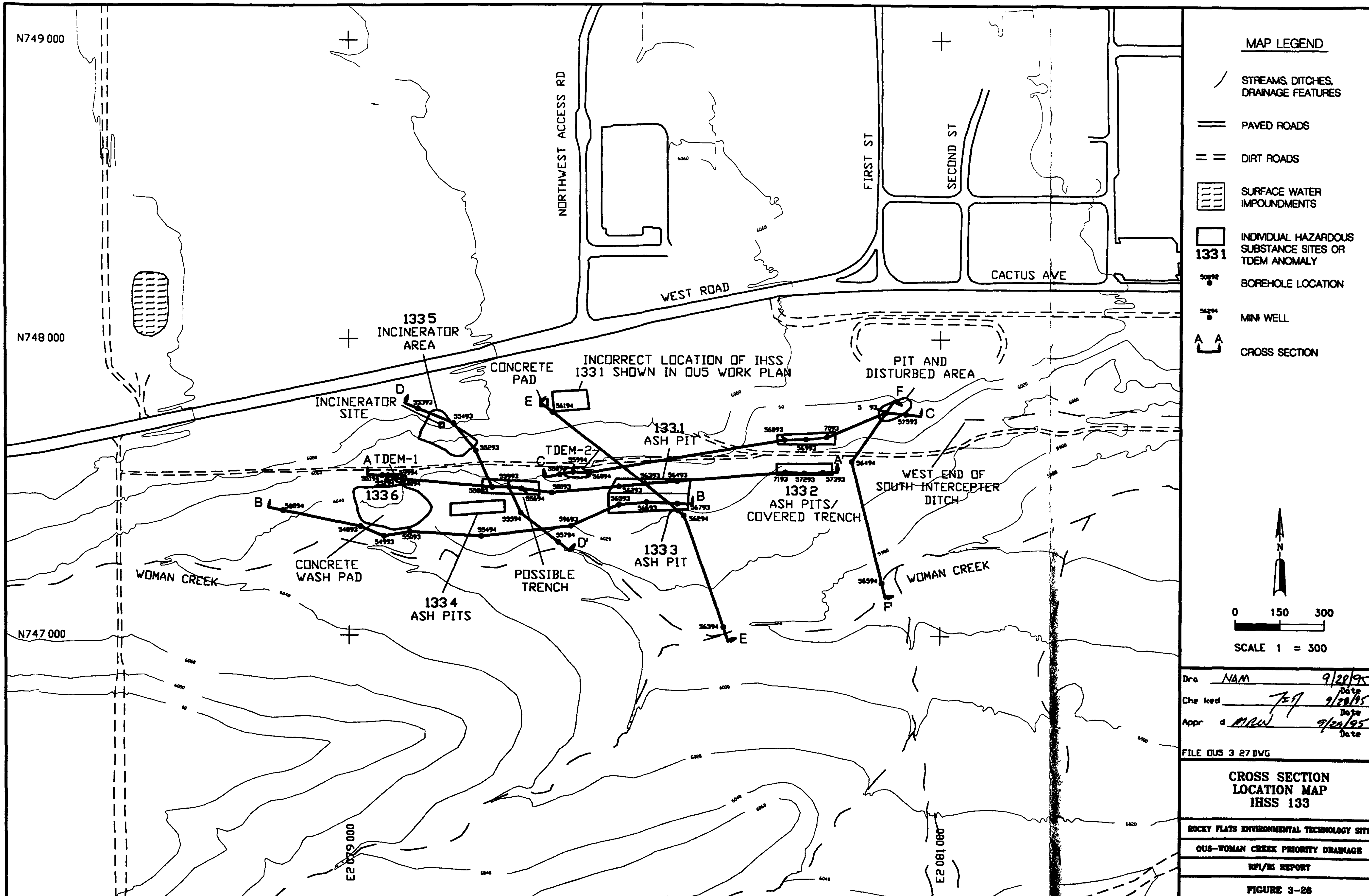
OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-24



MAP LEGEND
STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)
DRY AREA
WATER LEVEL CONTOUR
5961 WATER LEVEL ELEVATION
5961 WATER LEVEL NOT MEASURED OCT 19-24
WELL
WELLPOINT
SMALL DIAMETER WELL
N
0 100 200
SCALE 1 = 200
Drawn NAM 9/29/95
Checked 10/1/95 Date
Approved 10/10/95 Date
IHSS 115
LOW-WATER-LEVEL UHSU
POTENTIOMETRIC-SURFACE
MAP OF OCT 19-24 1994
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OUS-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 3-25
SOURCE OF DATA: RFEDS
196 FILTER BACKWASH PONDS
115 ORIGINAL LANDFILL
133 2 ASH PITS
6010
6000
5990
5980
5970
5960
5950
5940
5930




| | | |
|---|---|---|
| Dra NAM | 9/28/95 | Date |
| Che ked [signature] | 9/28/95 | Date |
| Appr d MRW | 9/29/95 | Date |

FILE OU5 3 27 DWG

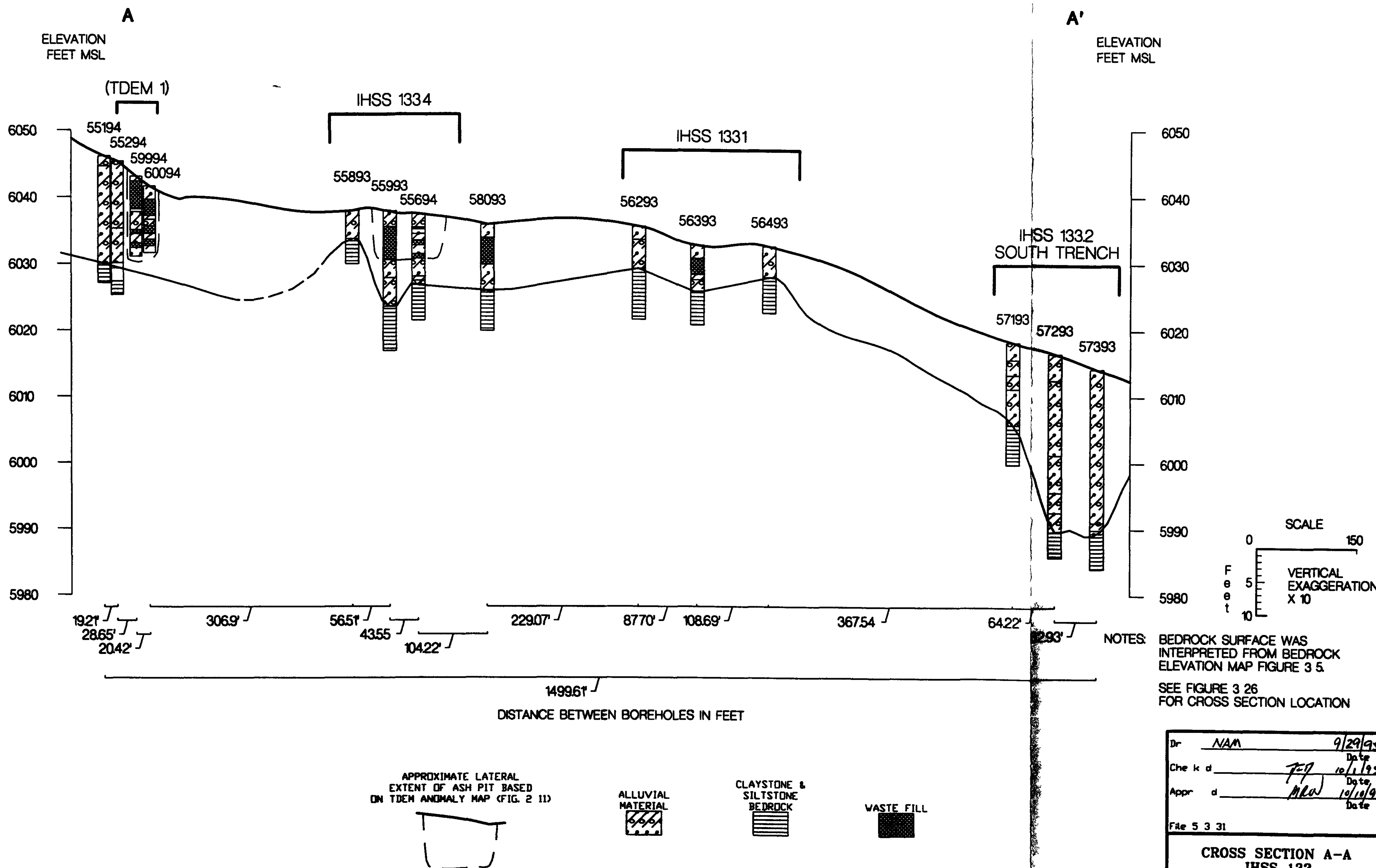
**CROSS SECTION LOCATION MAP IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-26




NOTES: BEDROCK SURFACE WAS INTERPRETED FROM BEDROCK ELEVATION MAP FIGURE 3 5.

SEE FIGURE 3 26 FOR CROSS SECTION LOCATION

SOURCE OF DATA: LOGIT LOGS

| | | |
|---|---|---|
| Dr NAM | 9/29/95 | Date |
| Checked | 10/1/95 | Date |
| Approved MRW | 10/10/95 | Date |

File 5 3 31

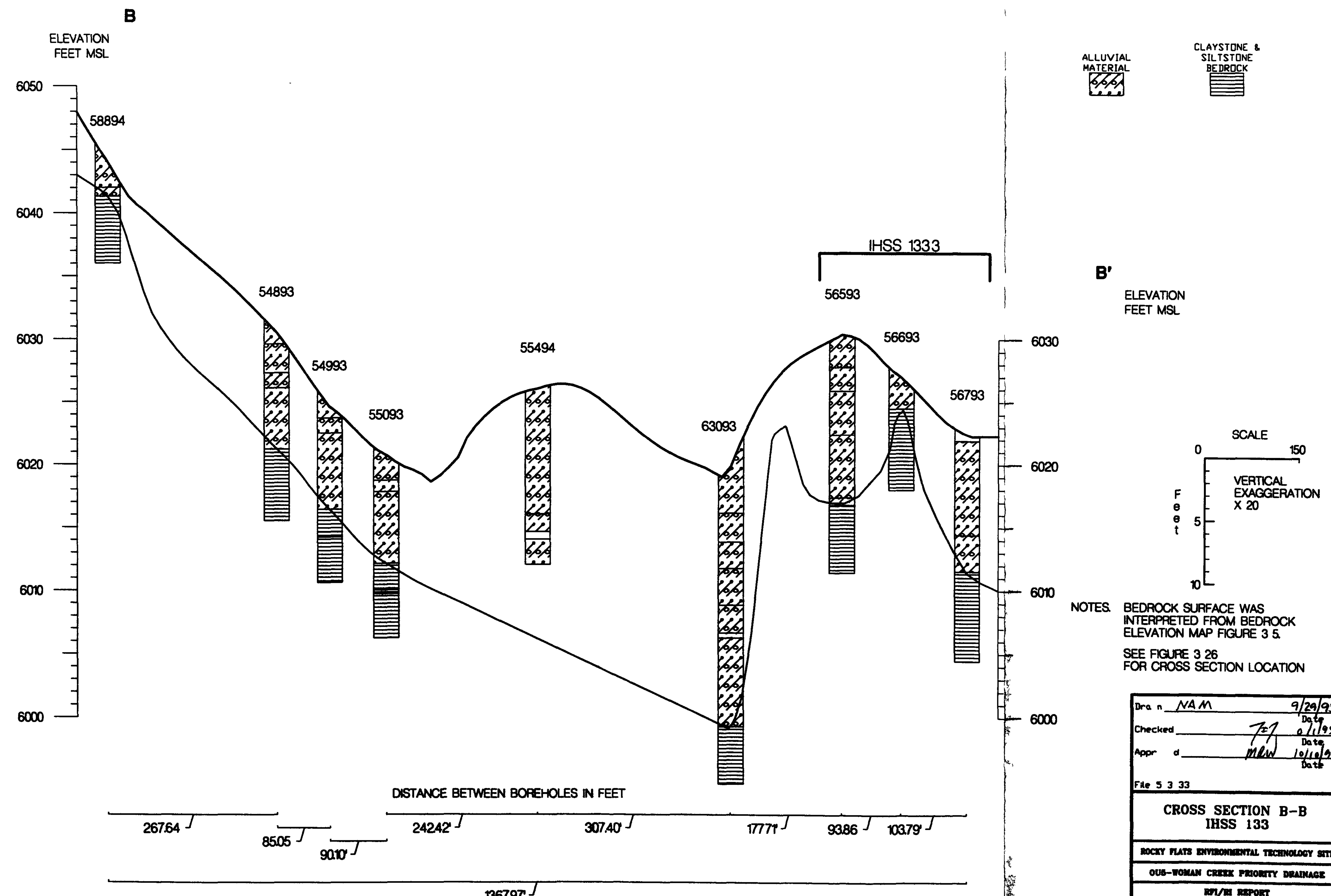
**CROSS SECTION A-A**
**IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-27




NOTES. BEDROCK SURFACE WAS INTERPRETED FROM BEDROCK ELEVATION MAP FIGURE 3 5.

SEE FIGURE 3 26 FOR CROSS SECTION LOCATION

SOURCE OF DATA: LOGIT LOGS

| | |
|---|---|
| Drawn NAM | 9/29/95 Date |
| Checked [illegible] | 10/1/95 Date |
| Approved MRW | 10/10/95 Date |
| File 5 3 33 | |

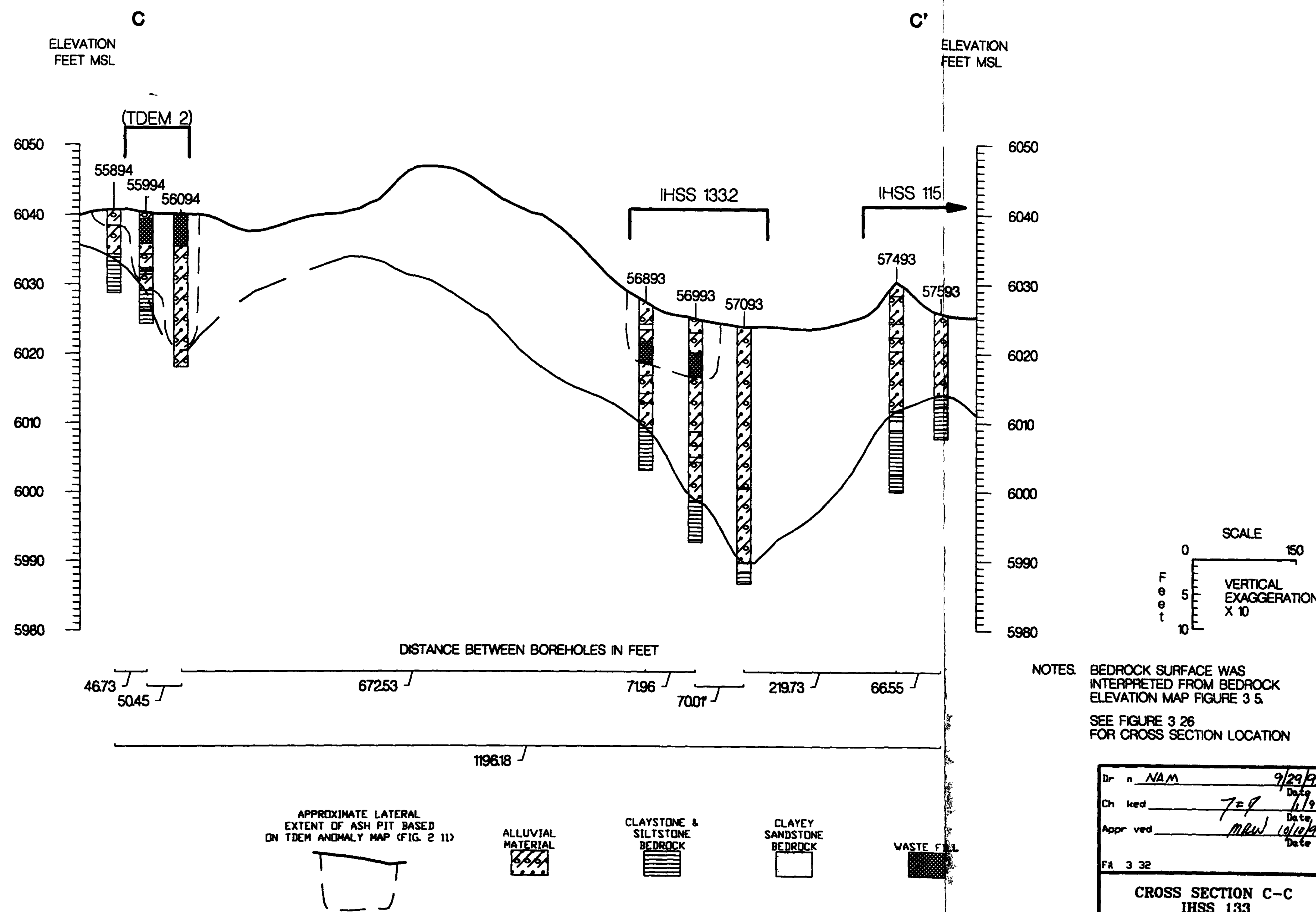
**CROSS SECTION B-B**
**IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-28




NOTES. BEDROCK SURFACE WAS INTERPRETED FROM BEDROCK ELEVATION MAP FIGURE 3 5.

SEE FIGURE 3 26 FOR CROSS SECTION LOCATION

SOURCE OF DATA: LOGIT LOGS

| | |
|---|---|
| Drawn NAM | Date 9/29/95 |
| Checked TZ9 | Date 10/1/95 |
| Approved MRW | Date 10/10/95 |
| Fil 3 32 | |

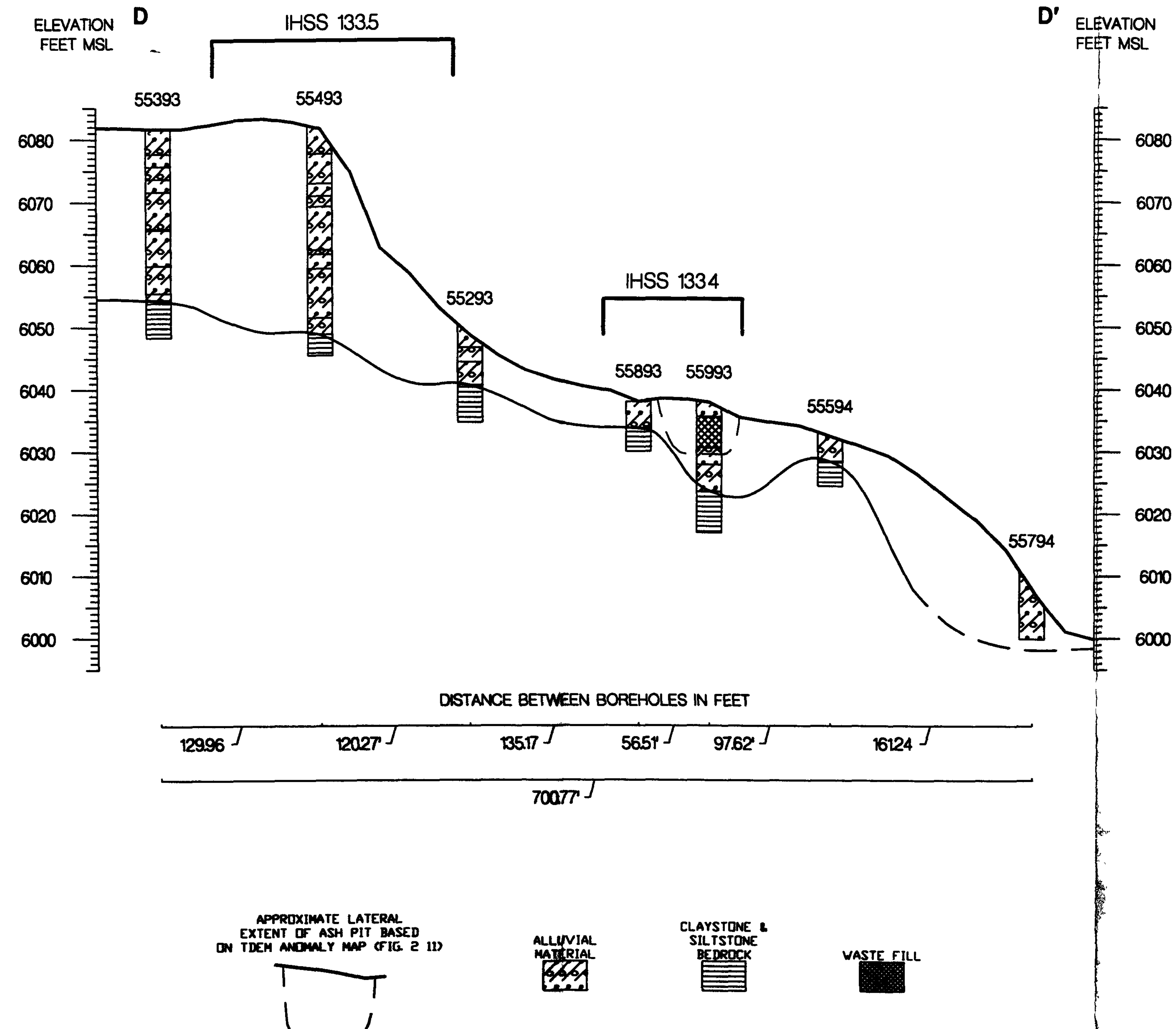
**CROSS SECTION C-C**
**IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-29




SCALE

0 — 100

Feet 5, 10

VERTICAL EXAGGERATION X 5

NOTES: BEDROCK SURFACE WAS INTERPRETED FROM BEDROCK ELEVATION MAP FIGURE 3 5.

SEE FIGURE 3 26 FOR CROSS SECTION LOCATION

SOURCE OF DATA: LOGIT LOGS

| | |
|---|---|
| Dr NAM | 9/29/95 Date |
| Checked 7EJ | 10/1/95 Date |
| Approved MRW | 10/10/95 Date |
| FN 5 3 27 | |

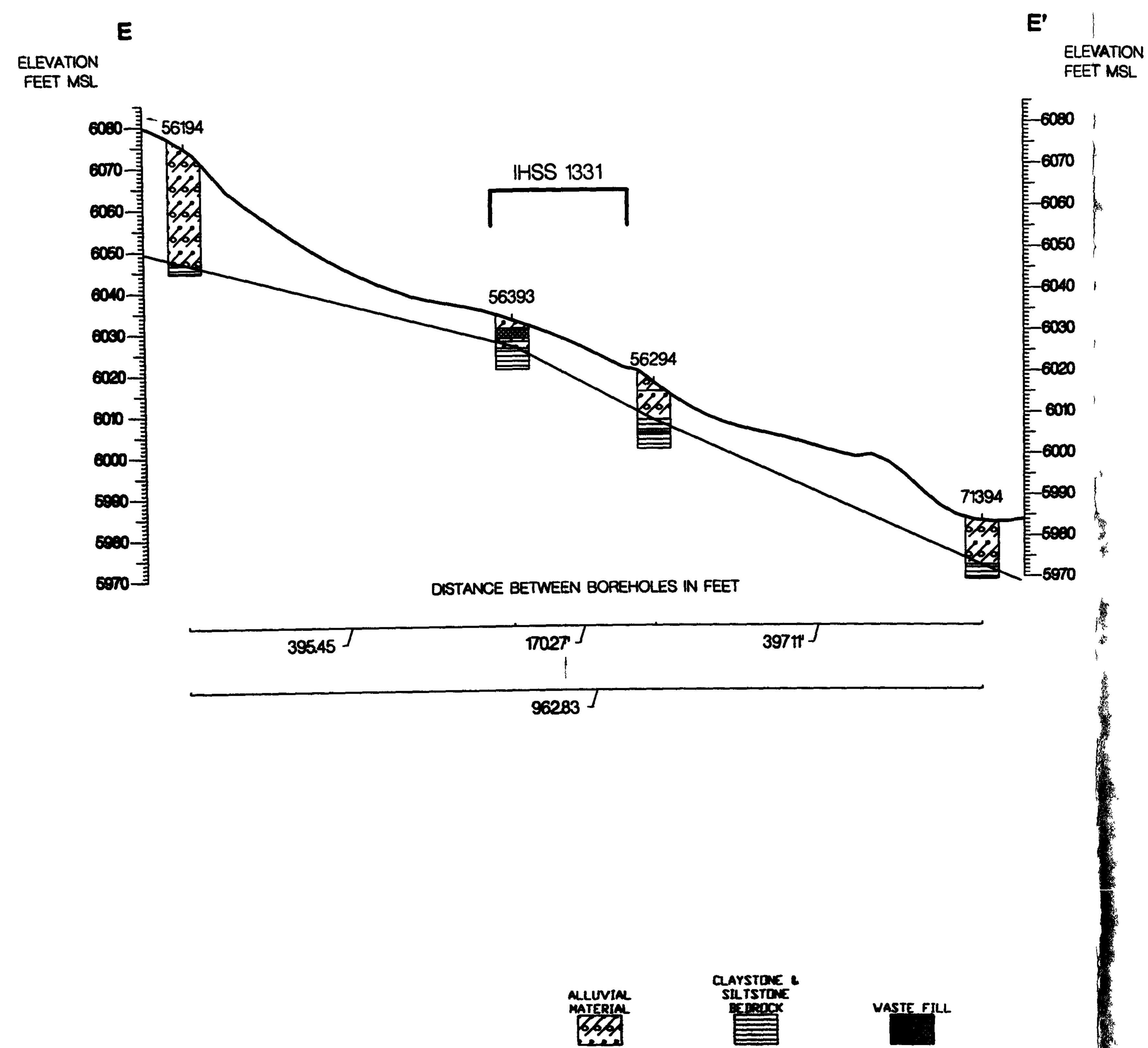
**CROSS SECTION D-D**
**IHSS 133**

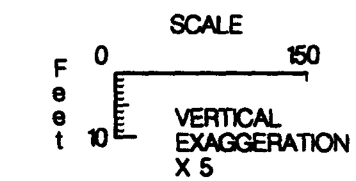
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OUS-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-30




NOTES: BEDROCK SURFACE WAS INTERPRETED FROM BEDROCK ELEVATION MAP FIGURE 3 5.

SEE FIGURE 3 26 FOR CROSS SECTION LOCATION

SOURCE OF DATA: LOGIT LOGS

| | |
|---|---|
| Drawn NAM | 9/29/95 Date |
| Checked [illegible] | 10/1/95 Date |
| Approved MEW | 10/10/95 Date |
| File 5 3 28 | |

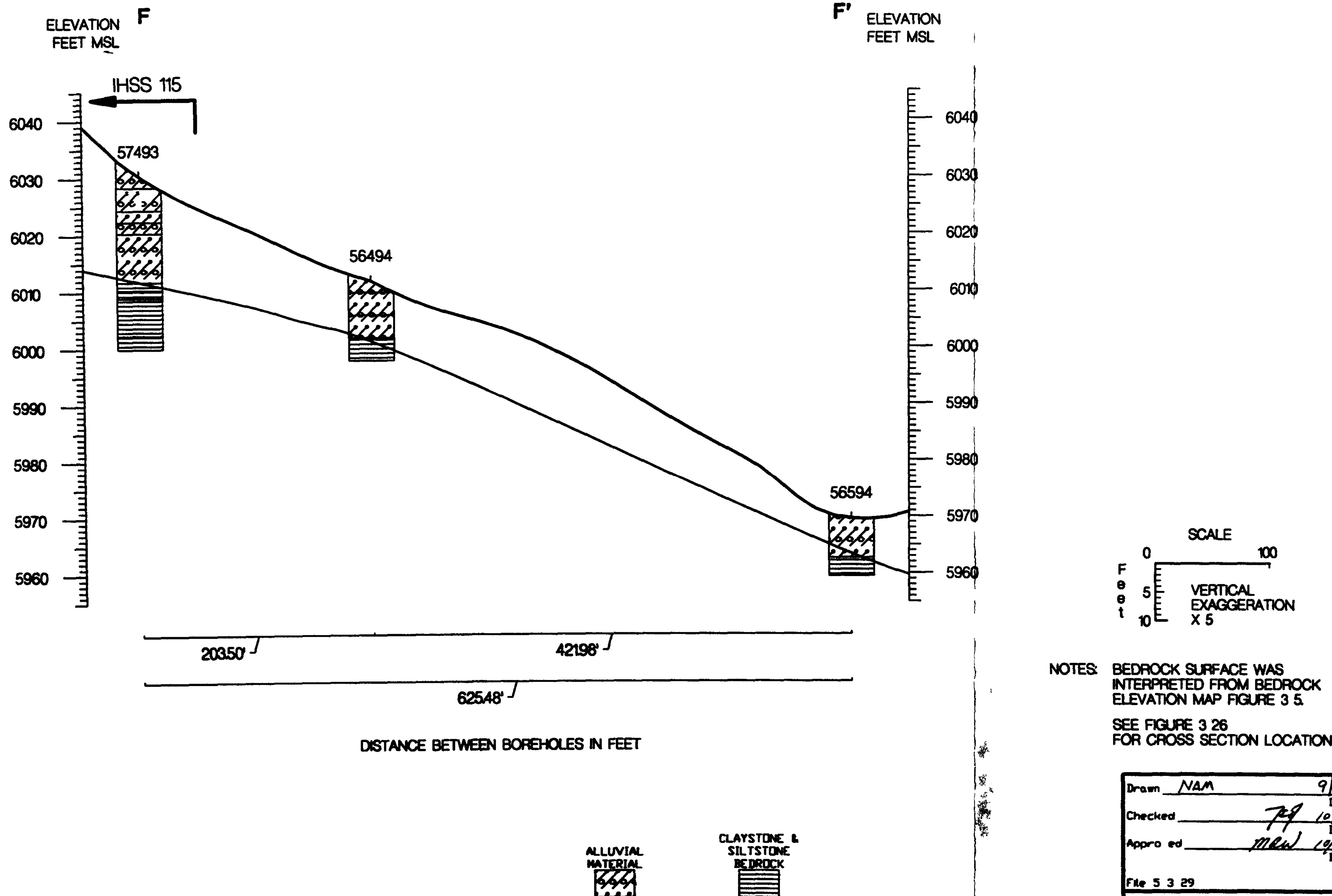
**CROSS SECTION E-E**
**IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-31




NOTES: BEDROCK SURFACE WAS INTERPRETED FROM BEDROCK ELEVATION MAP FIGURE 3 5.

SEE FIGURE 3 26 FOR CROSS SECTION LOCATION

SOURCE DATA: LOGIT LOGS

| | |
|---|---|
| Drawn NAM | 9/29/95 Date |
| Checked TJ | 10/1/95 Date |
| Approved MEW | 10/10/95 Date |
| File 5 3 29 | |

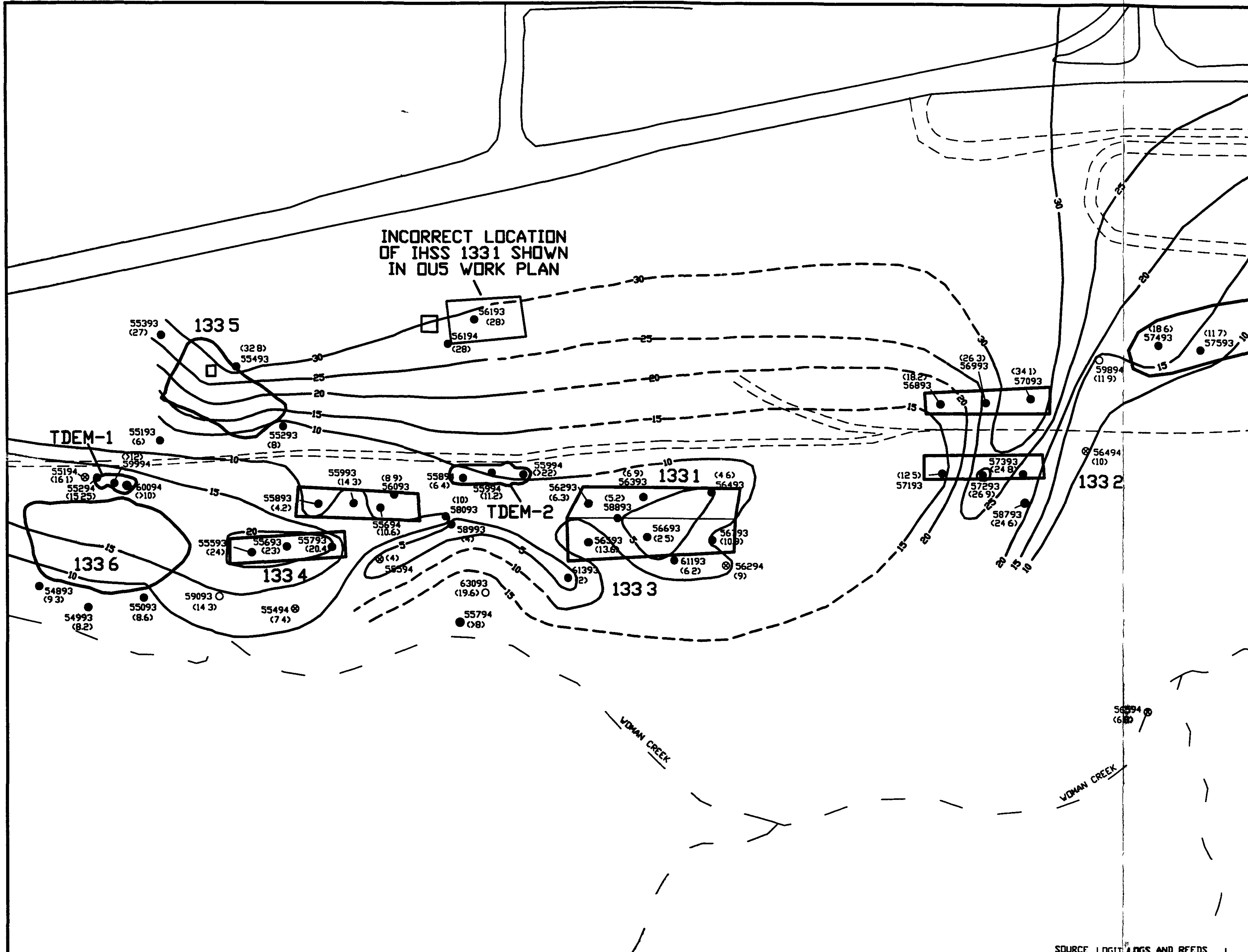
**CROSS SECTION F-F'**
**IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-32




MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- ORIGINAL LANDFILL AND SURFACE DISTURBANCE, PRE SID OR TDEM
- 57493 ● BOREHOLE LOCATION
- 59093 ○ WELL LOCATION
- 55494 ⊗ MINI WELL
- (7 2) UNCONSOLIDATED MATERIALS THICKNESS
- 15 UNCONSOLIDATED MATERIALS THICKNESS CONTOUR (5 INTERVAL)

N

0 75 150

SCALE 1 = 150

Dr NAM 10/11/95 Date

Che k d 7?? 10/?/95 Date

Appr d ?B? 10-16-95 Date

FILE 5 3 26 DWG

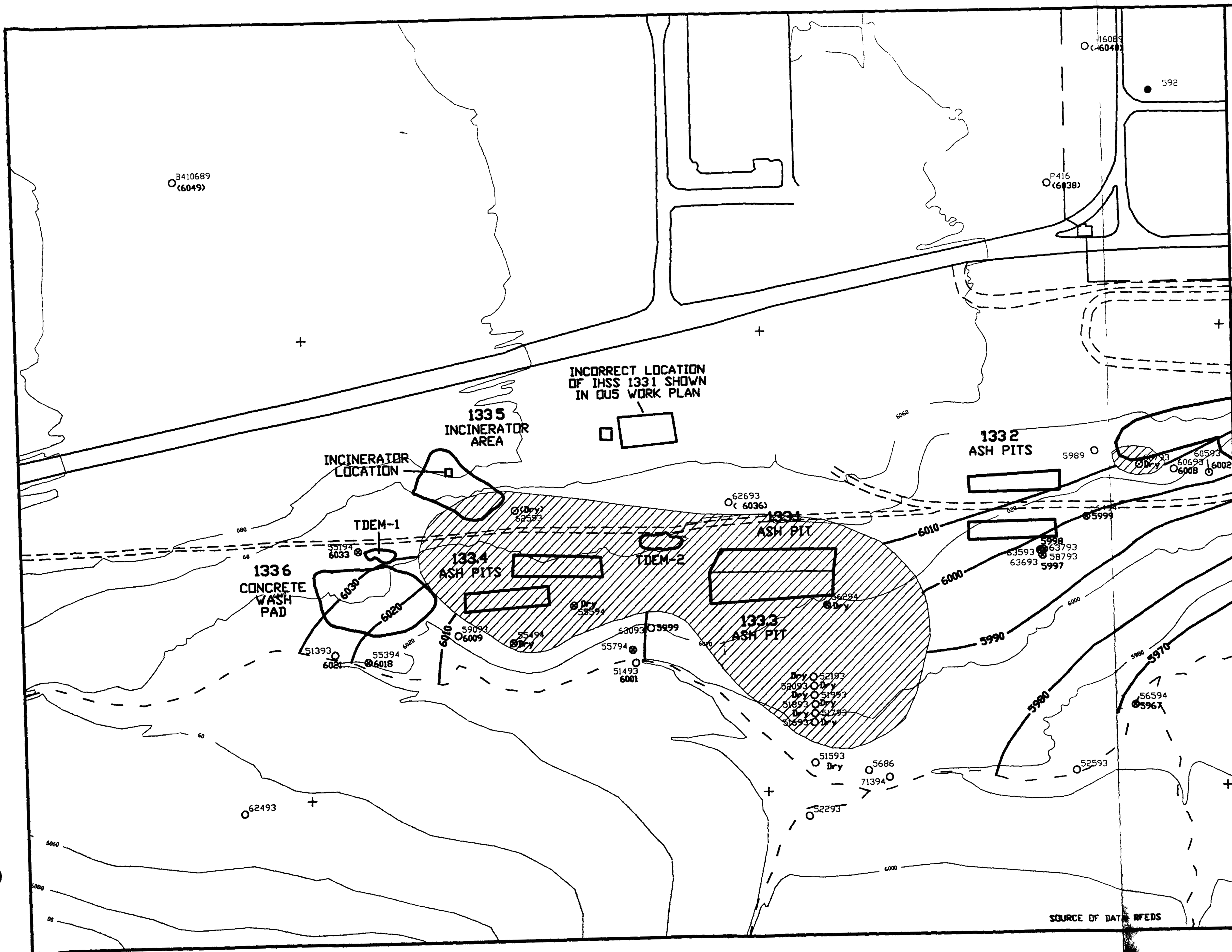
**UNCONSOLIDATED MATERIALS ISOPACH MAP IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-33




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)
- DRY AREA
- WATER LEVEL CONTOUR
- 55594 LOCATION CODE
- 5961 WATER LEVEL ELEVATION
- WELL
- WELLPOINT
- SMALL DIAMETER WELL

N

0 100 200

SCALE 1 = 200

D NAM 9/28/95 Date
Check d [signature] 9/28/95 Date
App d [signature] 9/29/95 Date

Fil 5 3 36

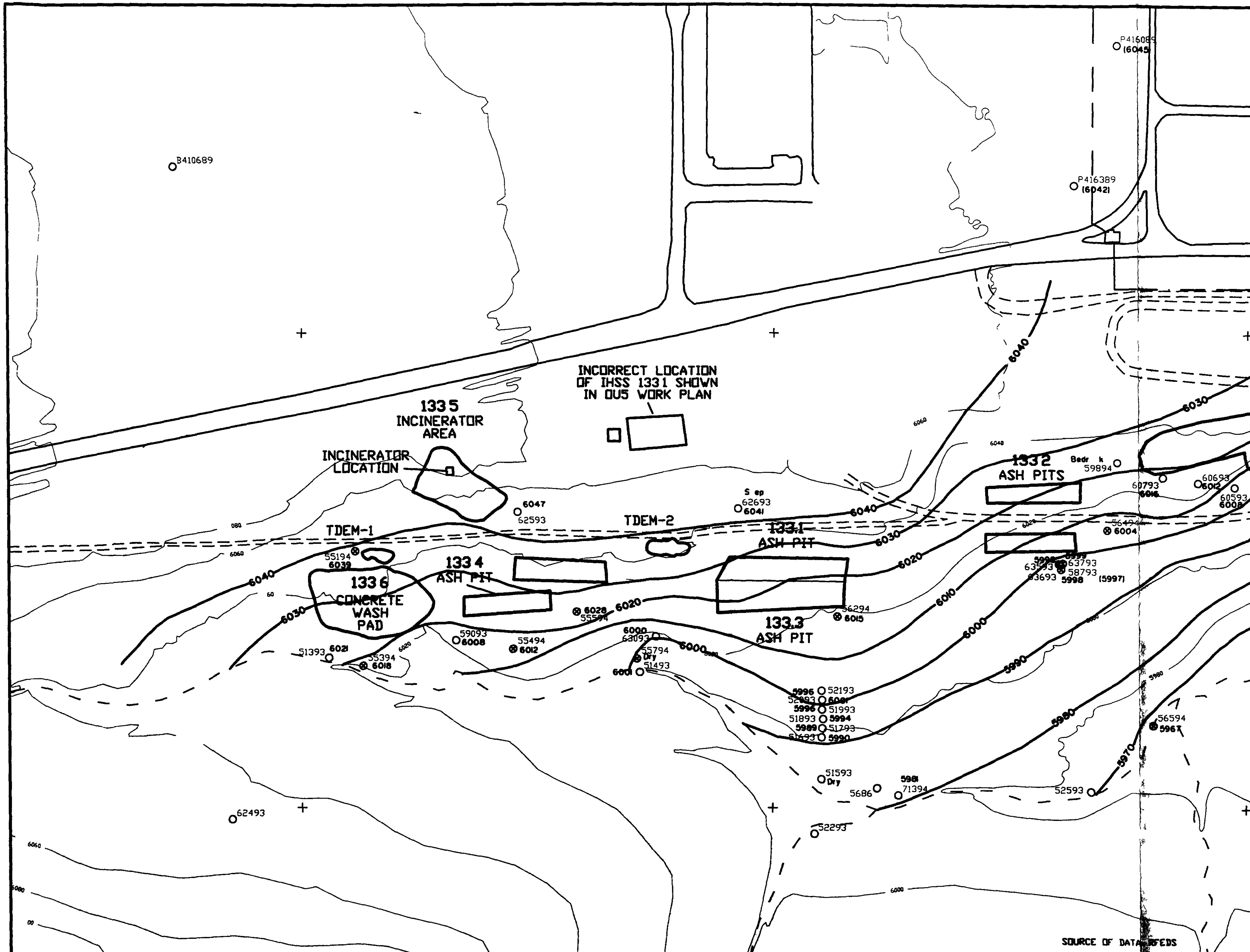
**IHSS 133**
**LOW-WATER-LEVEL UHSU POTENTIOMETRIC-SURFACE MAP OF OCT 19-24 1994**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-34




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES (APPROXIMATE LOCATION)
- WATER LEVEL CONTOUR
- 5559 LOCATION CODE
- 596 WATER LEVEL ELEVATION
- WELL
- WELLPOINT
- SMALL DIAMETER WELL

N

0 100 200

SCALE 1 = 200

| | | |
|---|---|---|
| Dr | NAM | 9/29/95 |
| Che k d | | Date 11/95 |
| Appro ed | MEW | Date 10/10/95 |

File 5 3 35

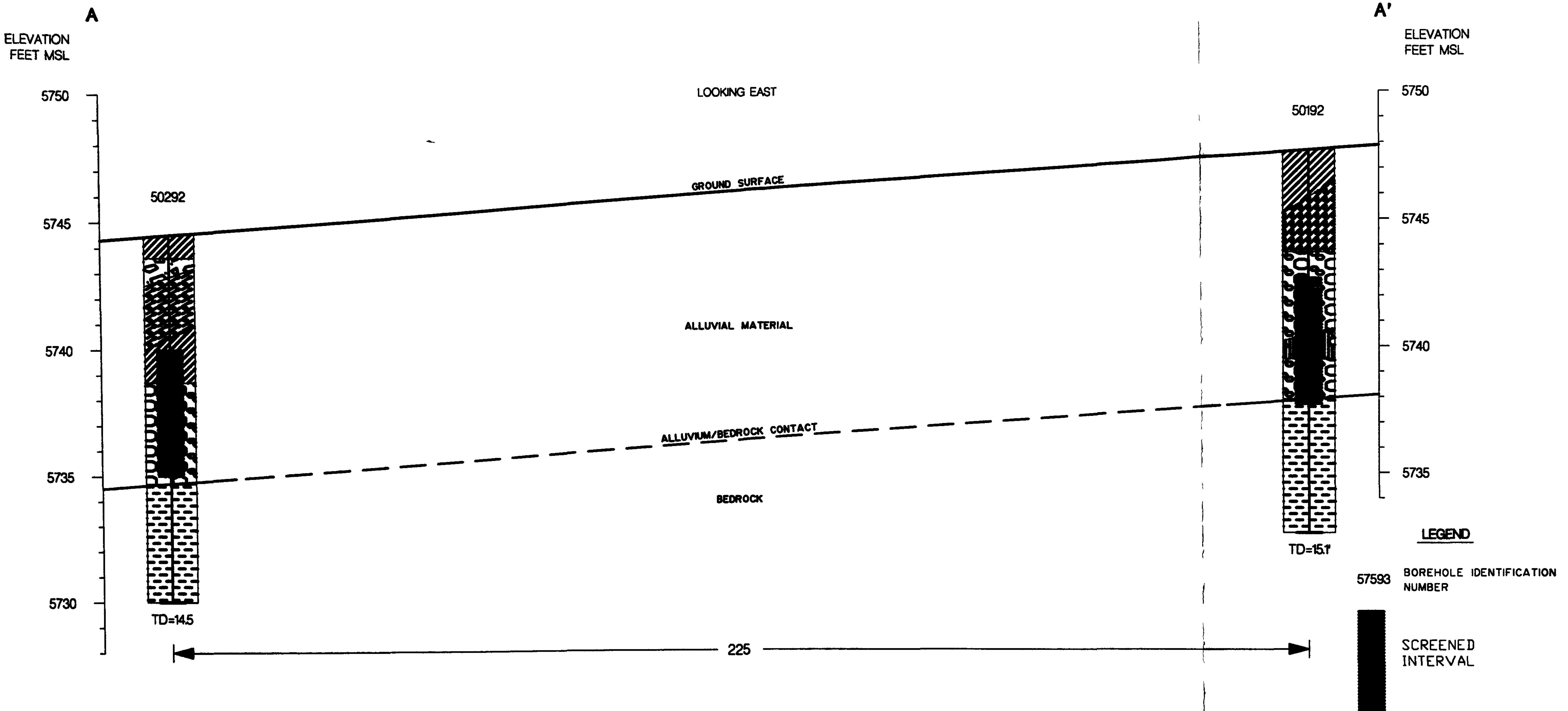
**IHSS 133 HIGH-WATER-LEVEL UHSU POTENTIOMETRIC-SURFACE MAP OF MAY 16-19 1995**

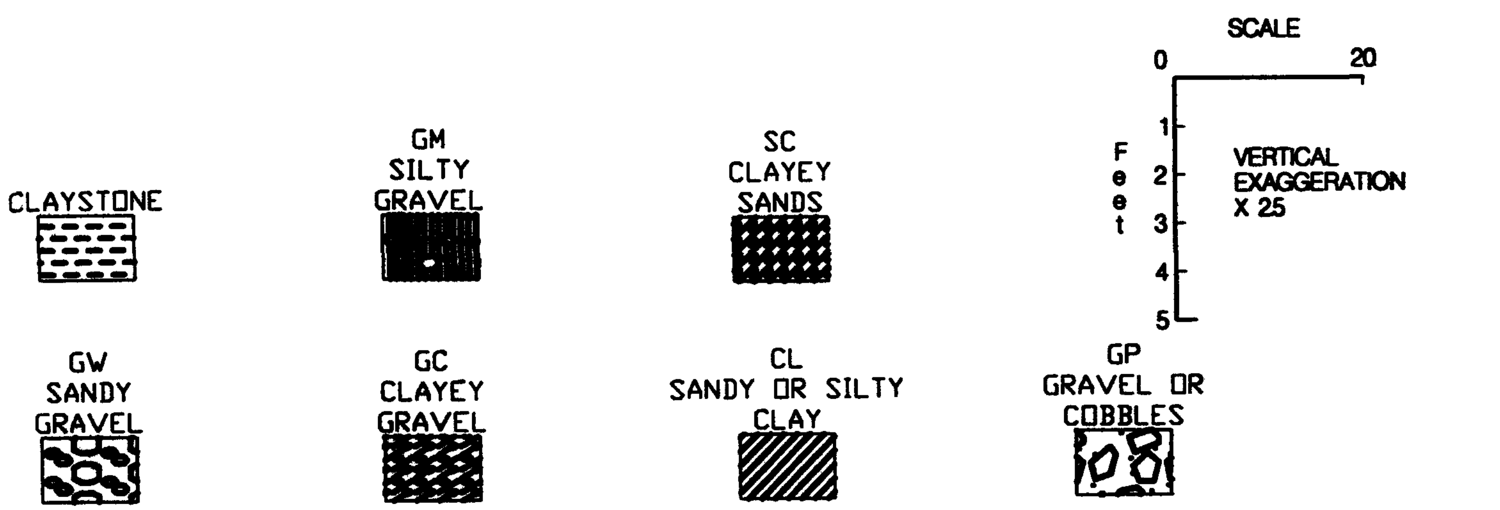
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

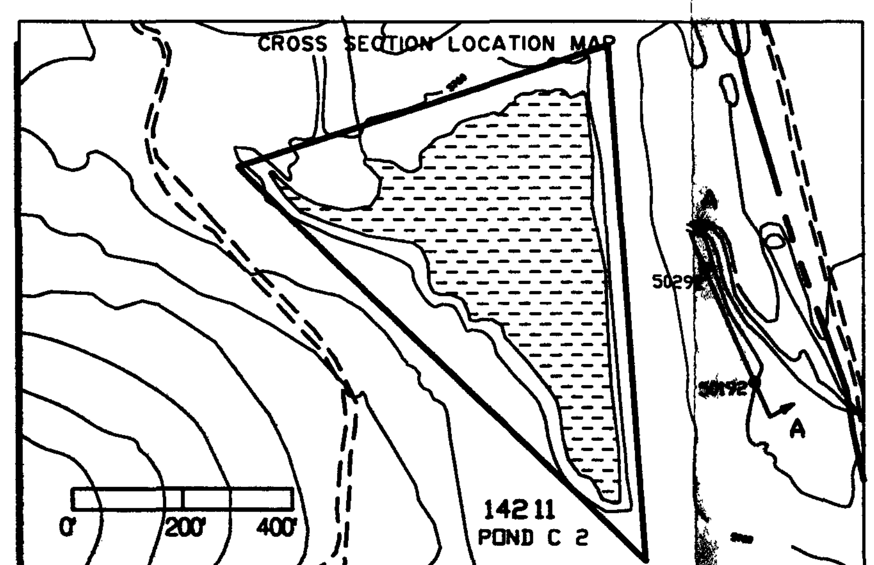
OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-36




NOTE No water levels are on record for these wells

SOURCE OF DATA LOGIT LOGS AND RFEDS

Drawn NAM 9/28/95 Date

Checked [signature] 9/28/95 Date

Approved [signature] 9/29/95 Date

FILE OU5 3 37 DWG

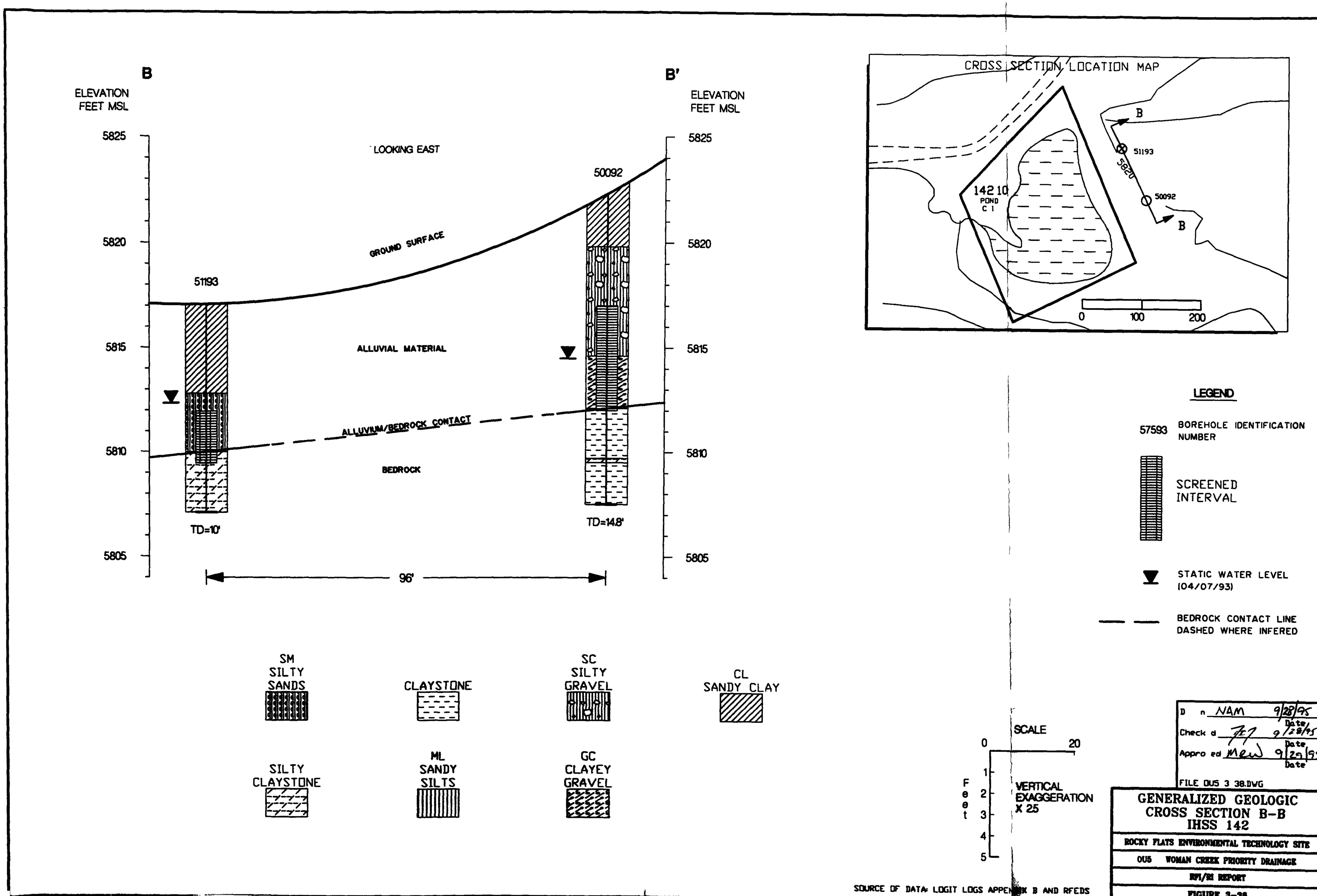
**GENERALIZED GEOLOGIC CROSS SECTION A–A IHSS 142**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 – WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-37



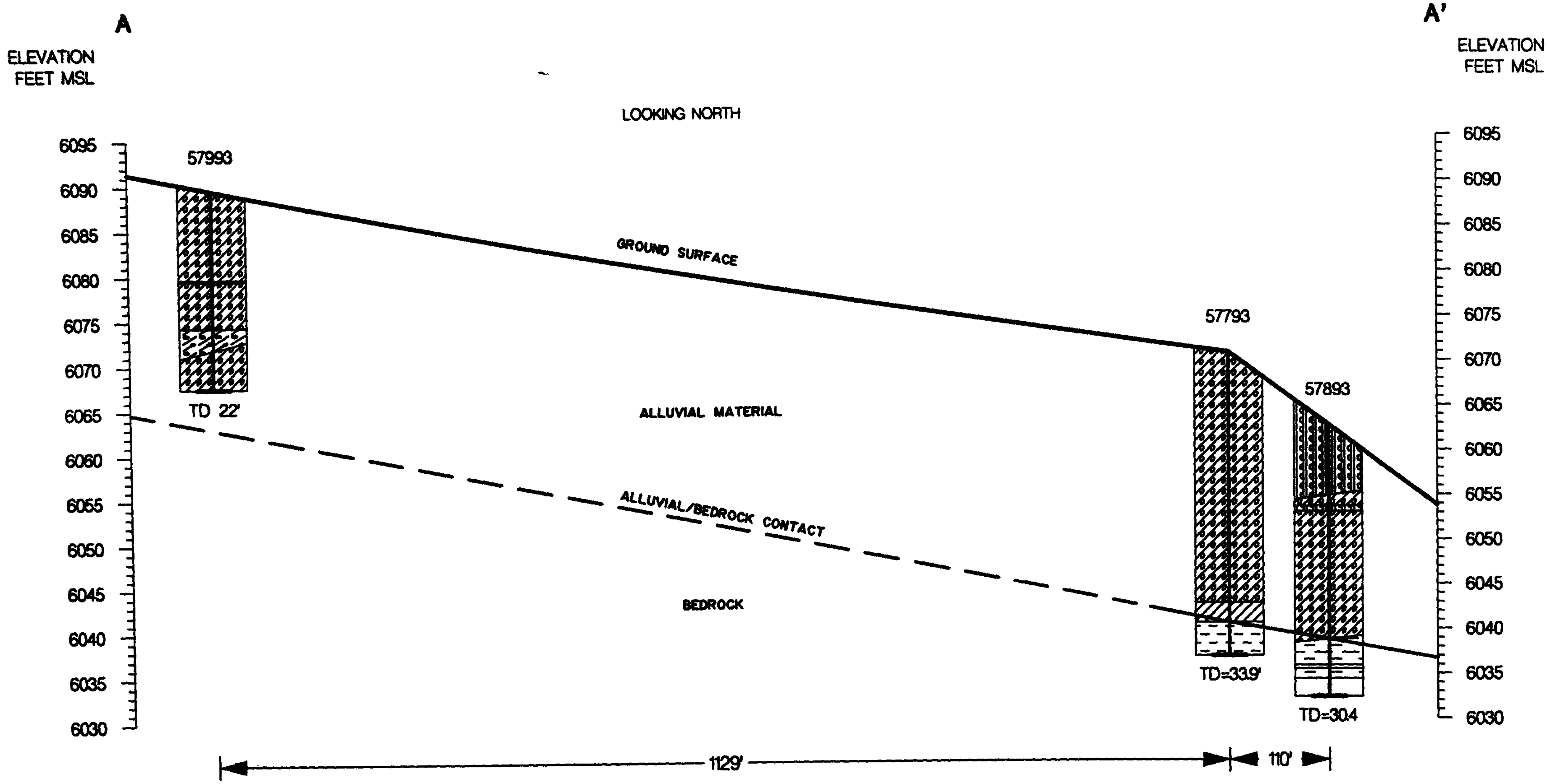

GENERALIZED GEOLOGIC CROSS SECTION B-B IHSS 142

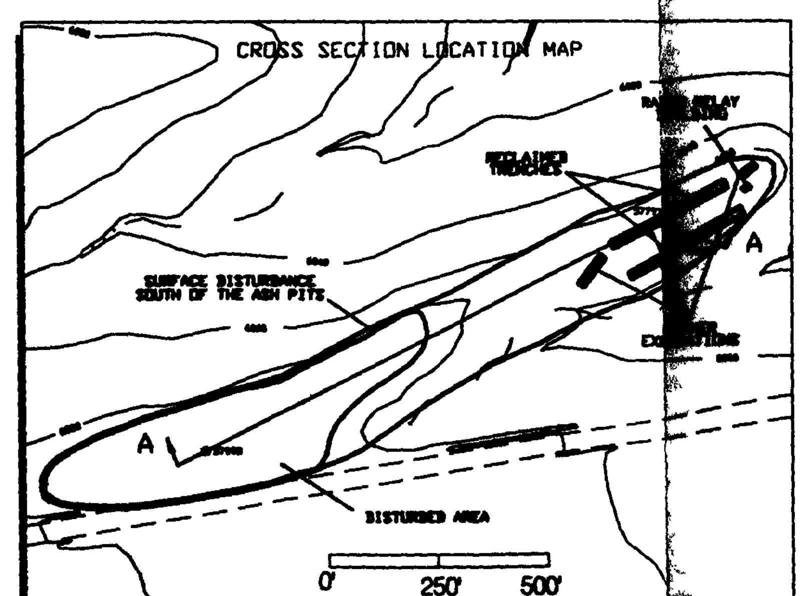
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-38




CLAYSTONE

GC CLAYEY GRAVEL

SC CLAYEY SANDS

SANDSTONE

SW SAND

CL SANDY CLAY

CLAYEY SANDSTONE

SM SILTY SANDS

SOURCE OF DATA: LOGIT LOGS AND RFEDS

**LEGEND**

57593 BOREHOLE IDENTIFICATION NUMBER

BEDROCK CONTACT LINE DASHED WHERE INFERRED

NOTE NO GROUNDWATER WAS ENCOUNTERED DURING DRILLING OF THESE BOREHOLES

SCALE

0 150

Feet 2 4 6 8 10

VERTICAL EXAGGERATION X 10

Drawn NAM 9/28/95 Date

Checked TEM 9/28/95 Date

Approved MRW 9/29/95 Date

FILE OU5 3 39 DWG

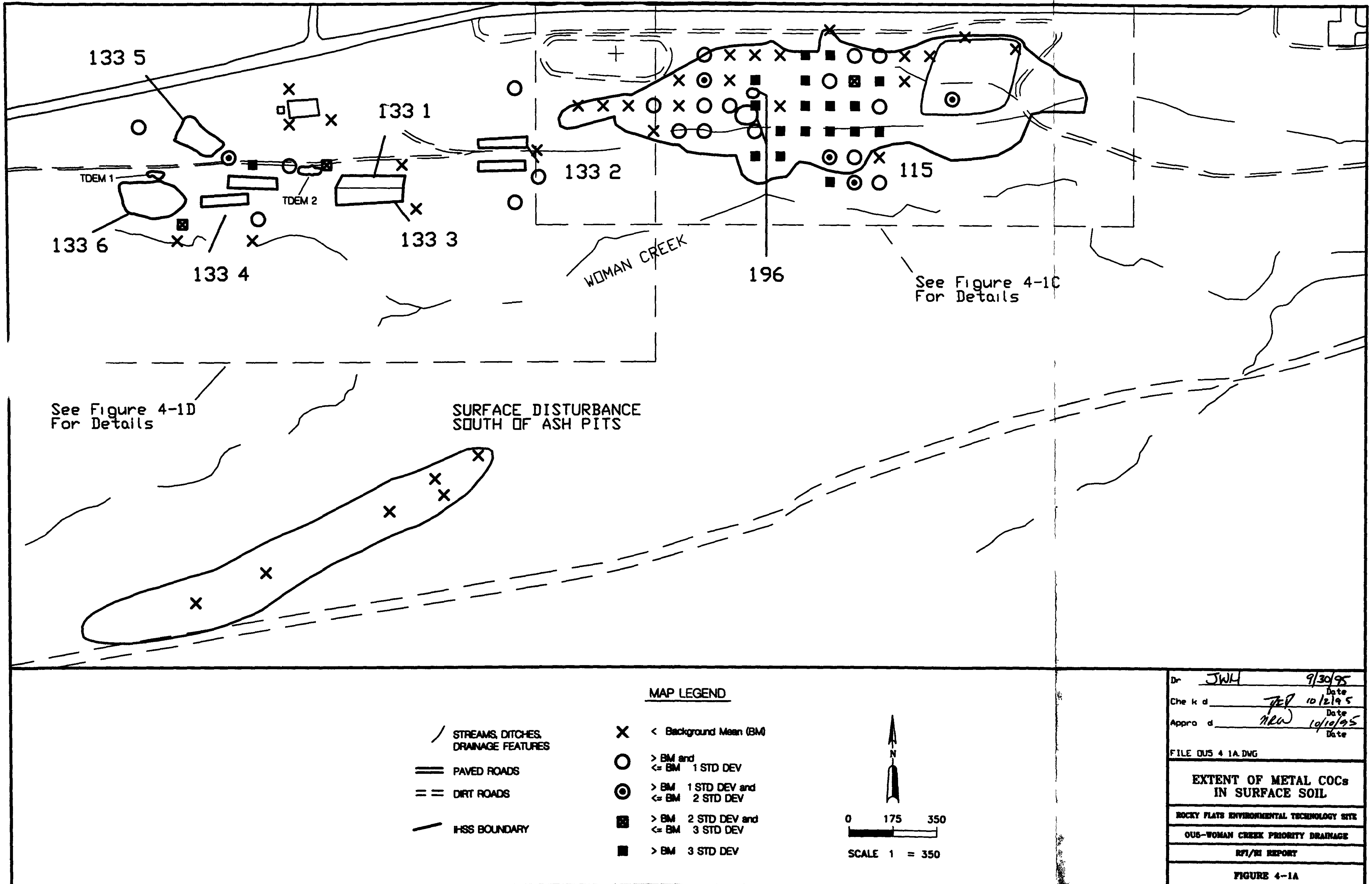
**GENERALIZED GEOLOGIC CROSS SECTION A-A SURFACE DISTURBANCE SOUTH OF THE ASH PITS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-39




| | |
|---|---|
| Dr JWH | 9/30/95 Date |
| Che k d [signature] | 10/2/95 Date |
| Appro d [signature] | 10/10/95 Date |

FILE OU5 4 1A DWG

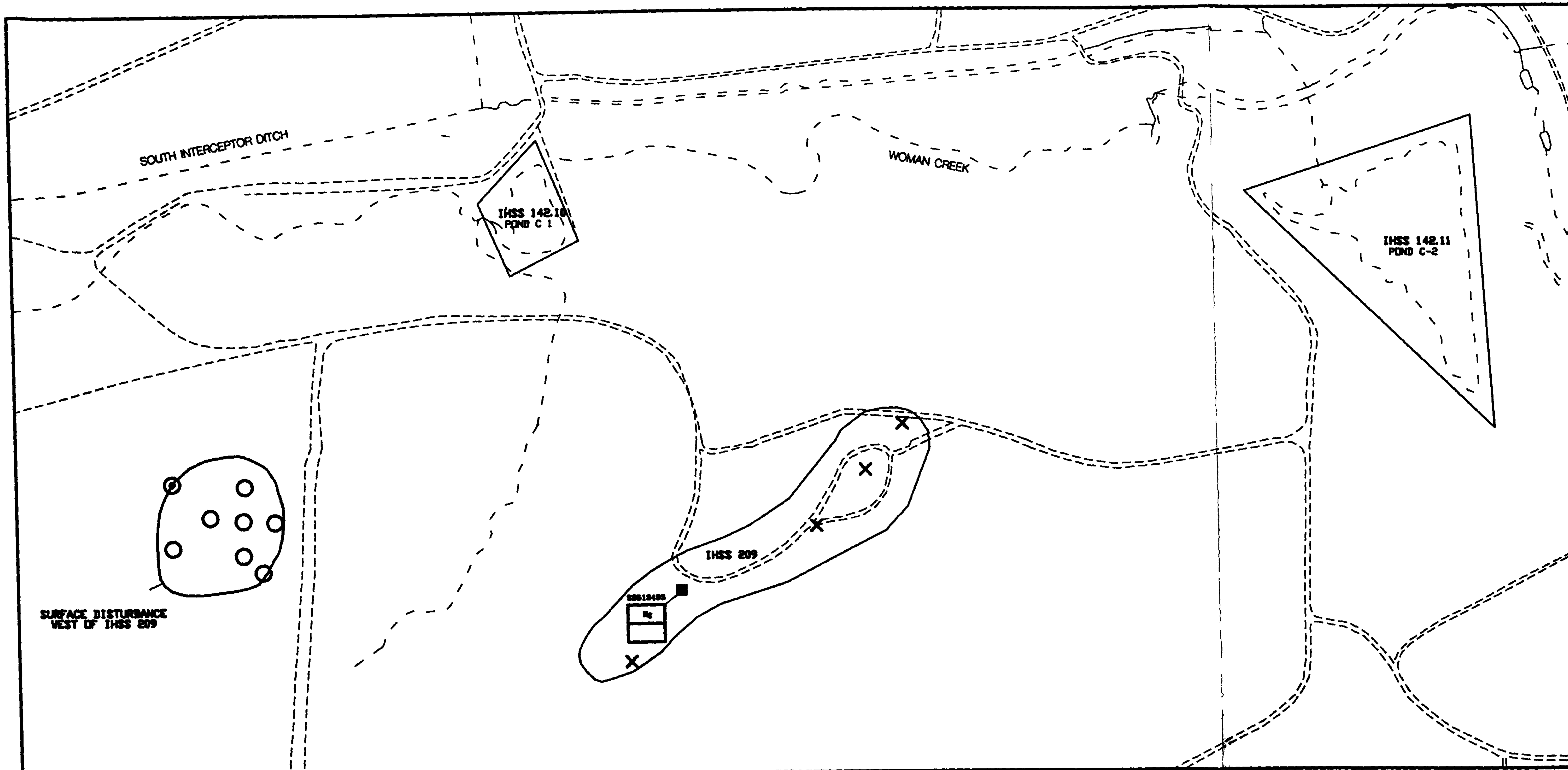
EXTENT OF METAL COCs IN SURFACE SOIL

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-1A




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

<- Background Mean (BM)
> BM and <= BM 1 STD DEV
> BM 1 STD DEV and <- BM 2 STD DEV
> BM 2 STD DEV and <= BM 3 STD DEV
> BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN(mg/kg) | STD. DEV |
|---|---|---|---|
| Cu | Copper | 13 41 | 4 22 |
| Hg | Mercury | 0 08 | 0 03 |
| Ag | Silver | 2 80 | 2 04 |

N

0 150 300

SCALE 1 300

Dr wn JWH 9/30/95 Date
Checked TJB 1/2/95 Date
Appro ed MAW 10/1/95 Date

FILE OU5 4 1B.DWG

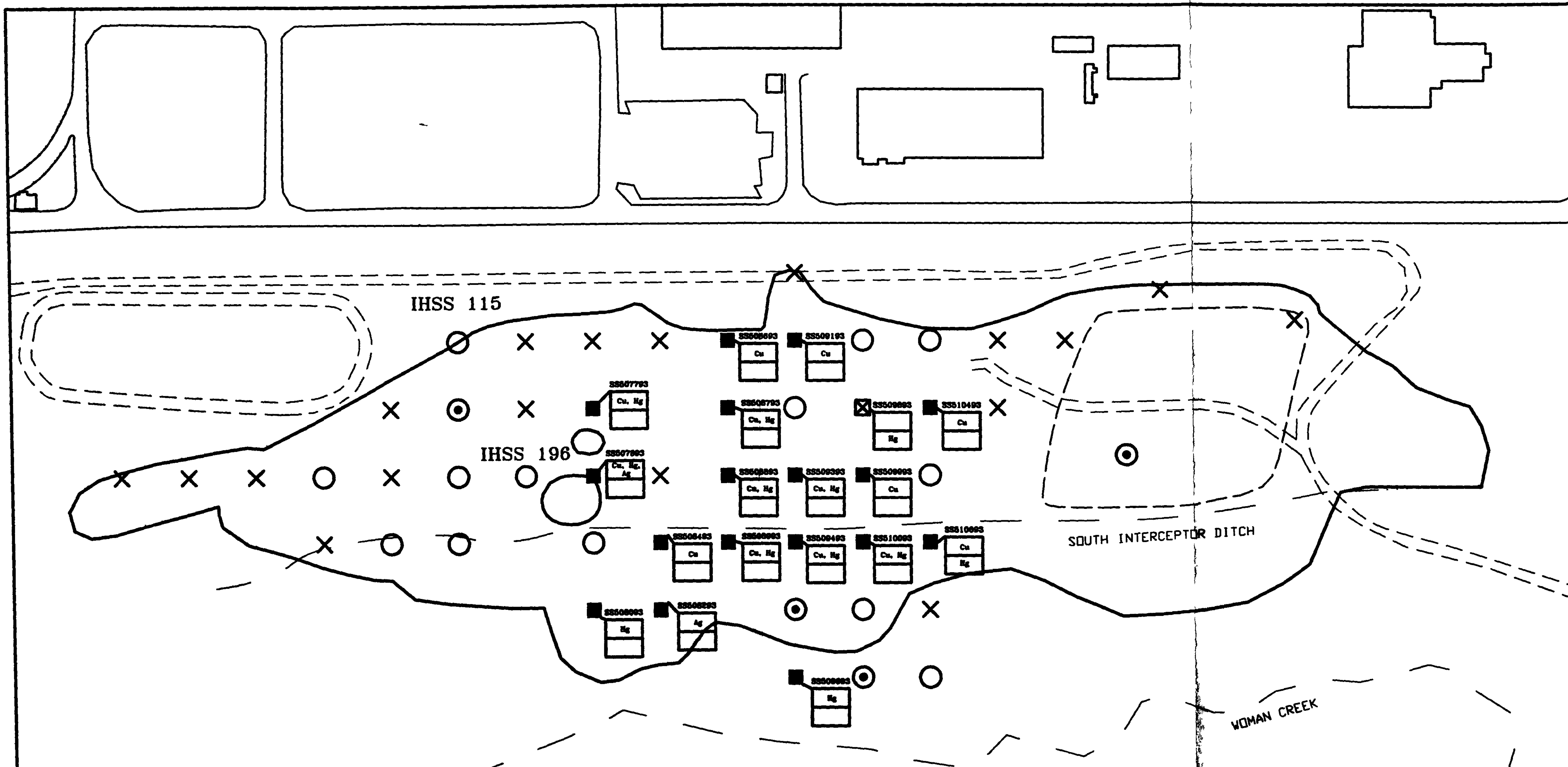
EXTENT OF METAL COCs IN SURFACE SOIL IHSS 142/209

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-1B




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- < Background Mean (BM)
- > BM and <- BM 1 STD DEV
- > BM 1 STD DEV and <- BM 2 STD DEV
- > BM 2 STD DEV and <- BM + 3 STD DEV
- > BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | MEAN(mg/kg) | STD. DEV |
|---|---|---|---|
| Cu | Copper | 13 41 | 4 22 |
| Hg | Mercury | 0 08 | 0 03 |
| Ag | Silver | 2 80 | 2 04 |

0 75 150
SCALE 1" = 150'

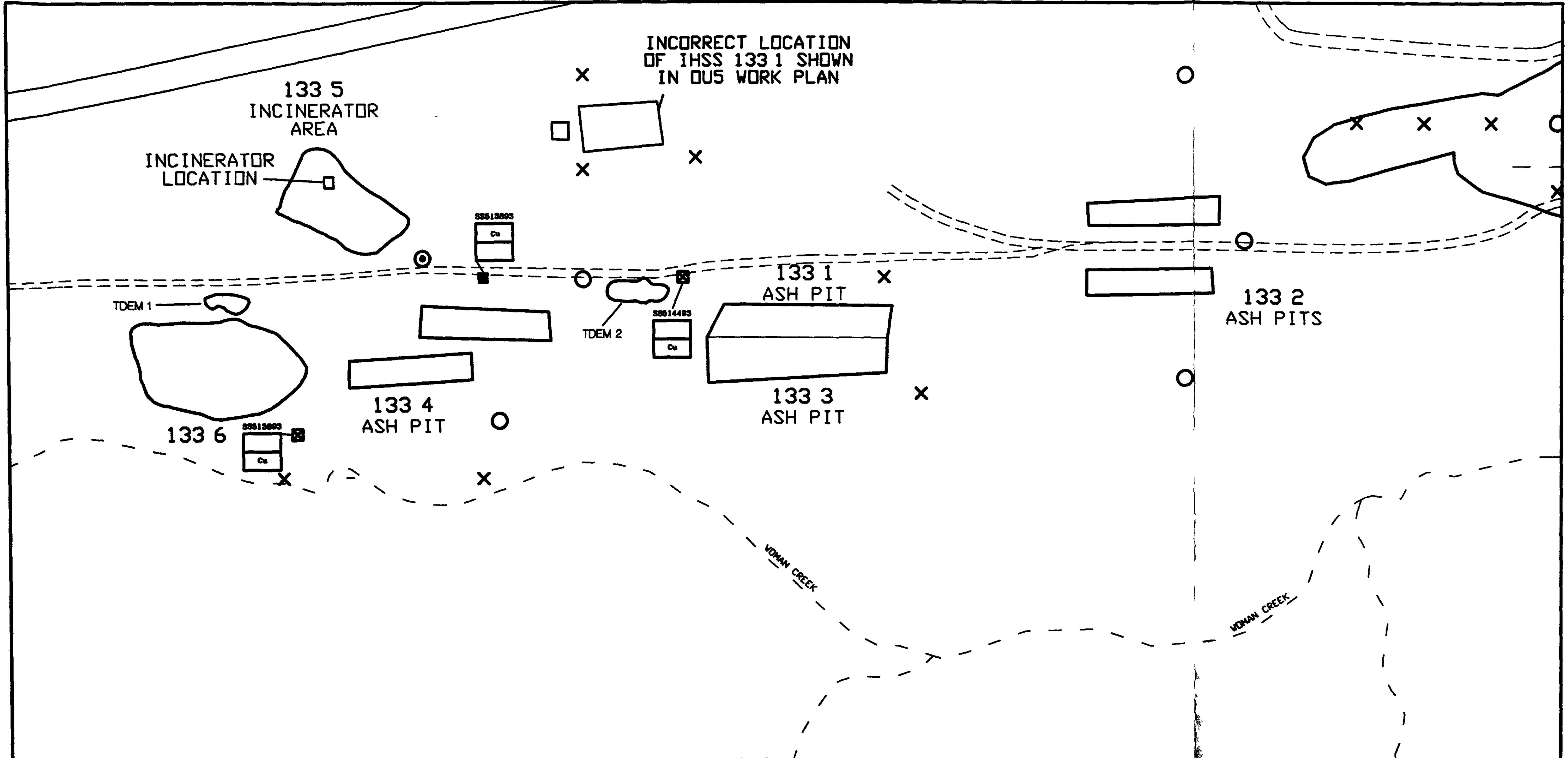
Dr JWH 9/30/95 Date
Checked [signature] 10/2/95 Date
Approved MEW 10/10/95 Date

FILE OU5 41C DWG

**EXTENT OF METAL COCs IN SURFACE SOIL IHSS 115/196**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT

FIGURE 4-1C




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

< Background Mean (BM)
> BM and < BM 1 STD DEV
> BM 1 STD DEV and < BM 2 STD DEV
> BM 2 STD DEV and <- BM 3 STD DEV
> BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS BM+2 STD DEV AND <=BM+3 STD DEV

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN(mg/kg) | STD DEV |
|---|---|---|---|
| Cu | Copper | 13 41 | 4 22 |
| Hg | Mercury | 0 08 | 0 03 |
| Ag | Silver | 2 80 | 2 04 |

N

0 75 150
SCALE 1 = 150

Drawn JWH 9/30/95 Date
Che k d TEJ 10/2/95 Date
Appr d MRW 10/ 0/95 Date

FILE OU5 4 1D.DWG

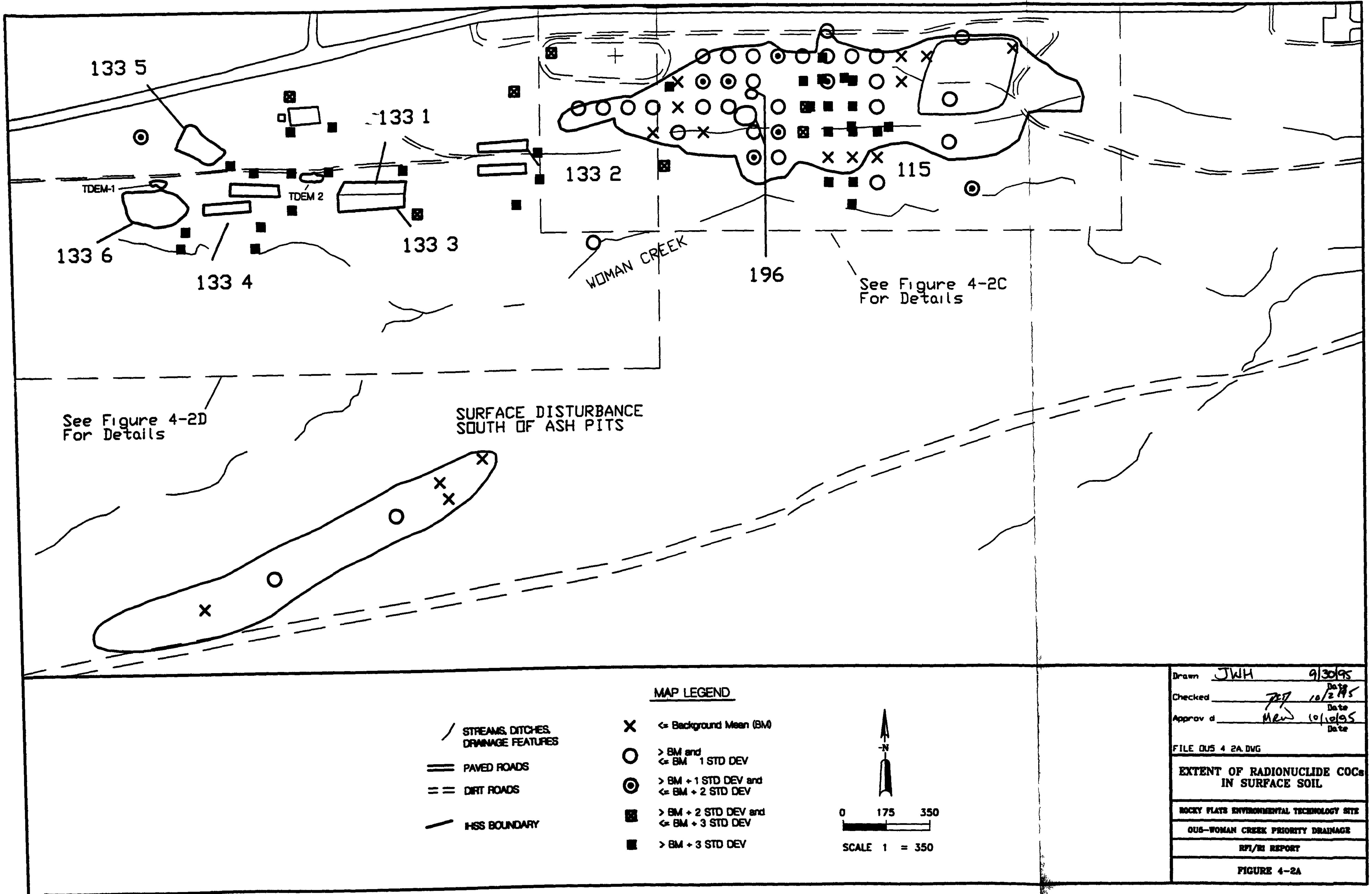
EXTENT OF METAL COCs
IN SURFACE SOIL
IHSS 133

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

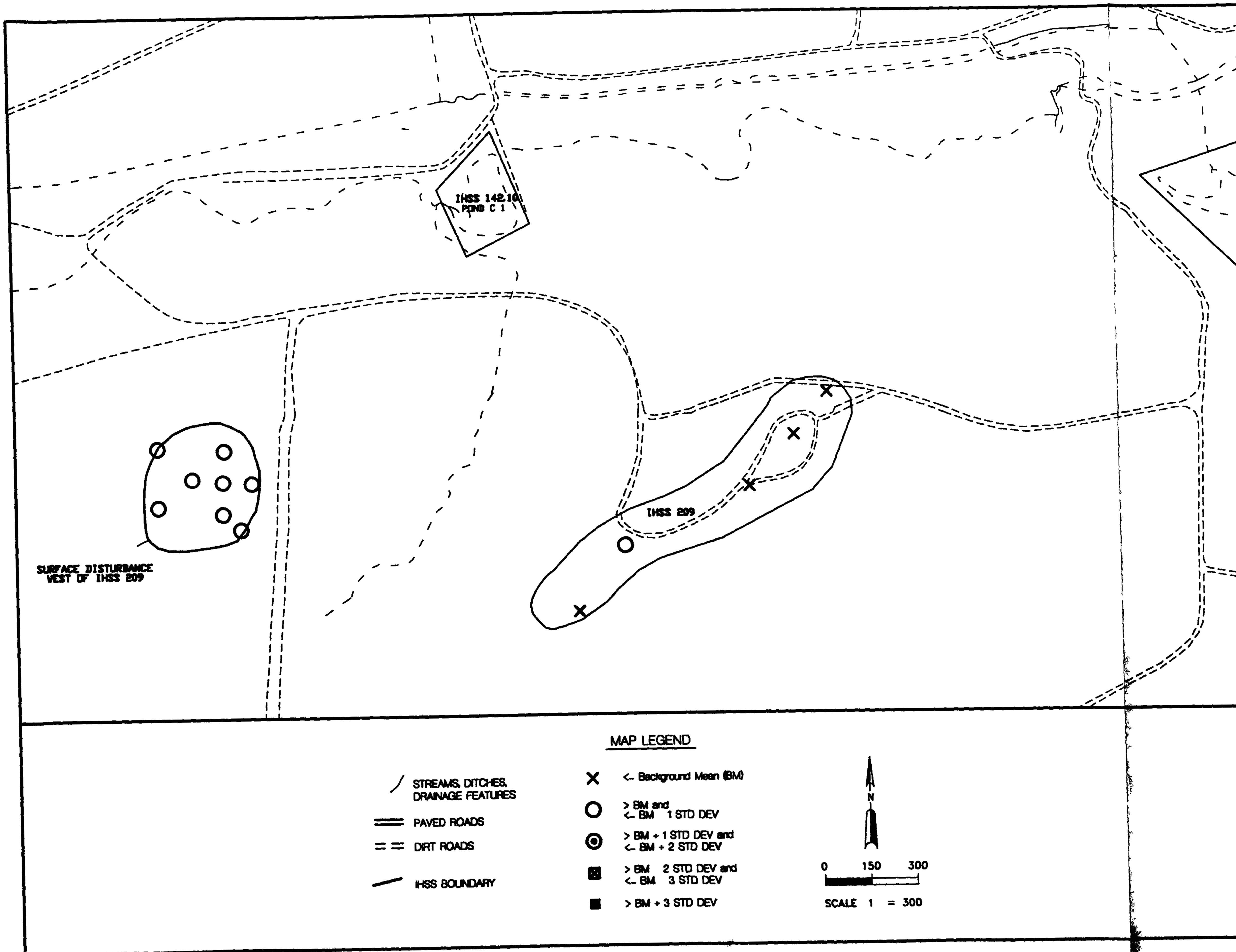
OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-1D



133 5
133 1
133 2
133 3
133 4
133 6
TDEM-1
TDEM 2
115
196
WOMAN CREEK
See Figure 4-2C For Details
See Figure 4-2D For Details
SURFACE DISTURBANCE SOUTH OF ASH PITS
MAP LEGEND
STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY
<= Background Mean (BM)
> BM and <= BM 1 STD DEV
> BM + 1 STD DEV and <= BM + 2 STD DEV
> BM + 2 STD DEV and <= BM + 3 STD DEV
> BM + 3 STD DEV
N
0 175 350
SCALE 1 = 350
Drawn JWH 9/30/95 Date
Checked 10/2/95 Date
Approv d MRW 10/10/95 Date
FILE OU5 4 2A DWG
EXTENT OF RADIONUCLIDE COCs IN SURFACE SOIL
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 4-2A




Dr wn JWH 9/30/95
Checked ___ Date 10/2/95
Appr d MRW Date 10/1/95
Date

FILE OU5 4 2B.DWG

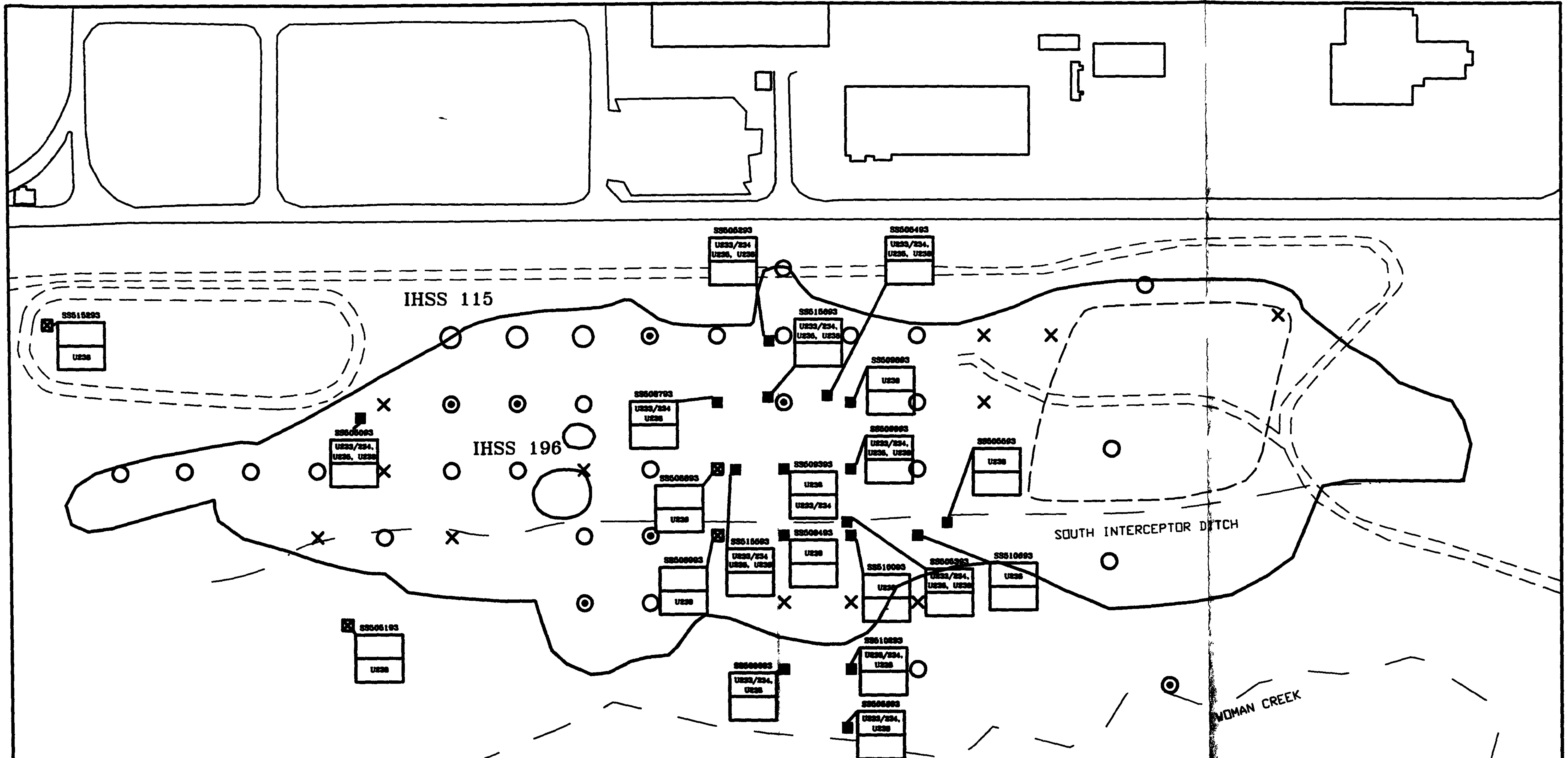
**EXTENT OF RADIONUCLIDE COCs IN SURFACE SOIL IHSS 142/209**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-2B




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- ✕ < Background Mean (BM)
- ○ > BM and < BM 1 STD DEV
- ◎ > BM 1 STD DEV and <- BM 2 STD DEV
- ⊠ > BM 2 STD DEV and <- BM 3 STD DEV
- ■ > BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | MEAN(pCi/g) | STD DEV |
|---|---|---|---|
| U233/234 | Uranium 233/234 | 0 822 | 0 380 |
| U235 | Uranium 235 | 0 039 | 0 052 |
| U238 | Uranium 238 | 0 733 | 0 413 |

0 75 150
SCALE 1 = 150

Dra n JWH 9/30/95 Date
Check d 10/12/95 Date
Approv d 10/10/95 Date

FILE OU5 4 2C DWG

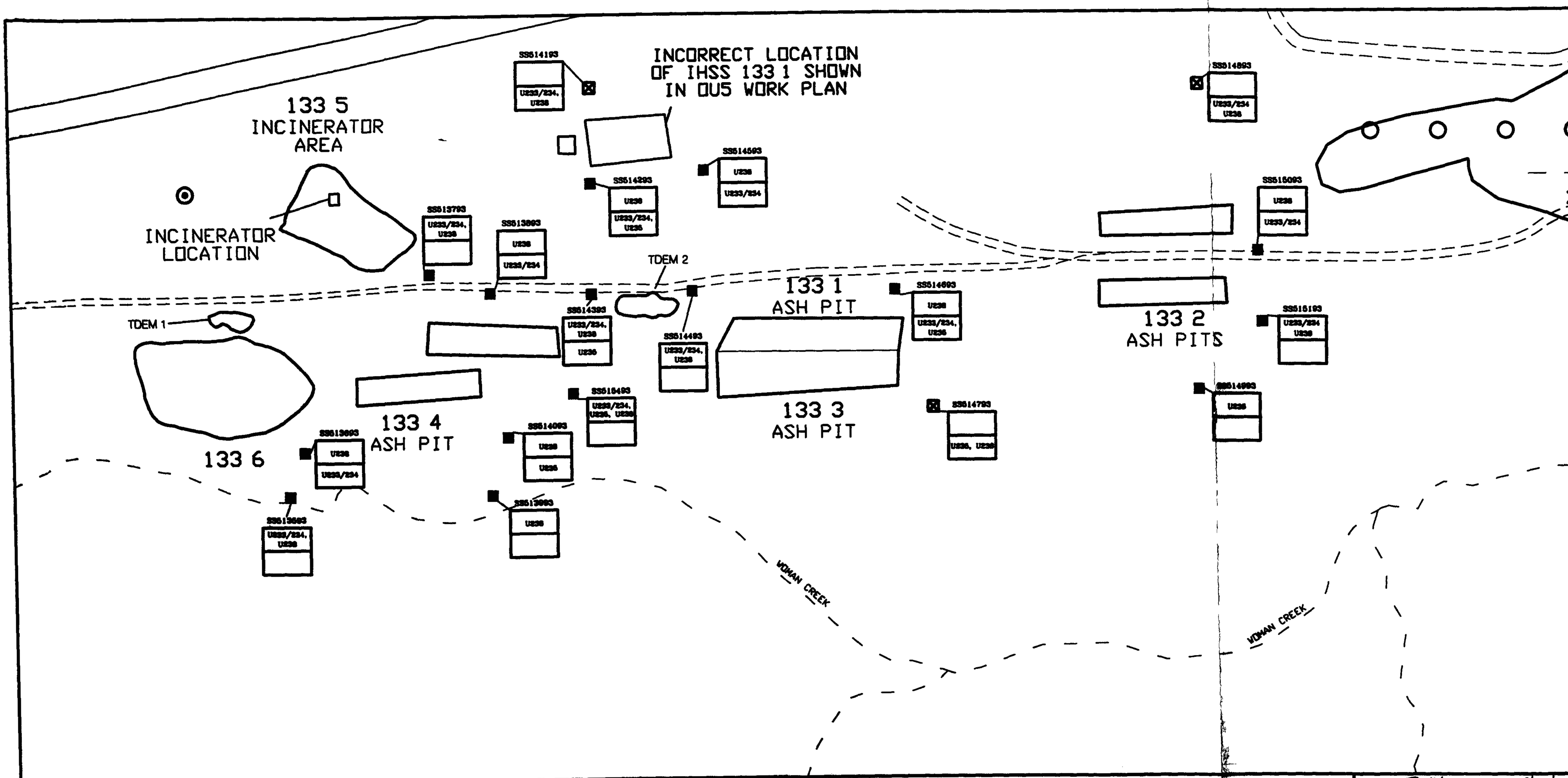
**EXTENT OF RADIONUCLIDE COCs IN SURFACE SOIL IHSS 115/196**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

**FIGURE 4-2C**




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

IHSS BOUNDARY

< Background Mean (BM)

> BM and <= BM 1 STD DEV

> BM 1 STD DEV and < BM 2 STD DEV

> BM 2 STD DEV and <= BM 3 STD DEV

> BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN(pCi/g) | STD DEV |
|---|---|---|---|
| U233/234 | Uranium 233/234 | 0 822 | 0.380 |
| U235 | Uranium 235 | 0 039 | 0 052 |
| U238 | Uranium 238 | 0 733 | 0 413 |

N

0 75 150

SCALE 1 = 150

Drawn JWH 9/30/95 Date
Checked [illegible] 10/2/95 Date
Approved [illegible] 10/10/95 Date

FILE OU5 4 2D.DWG

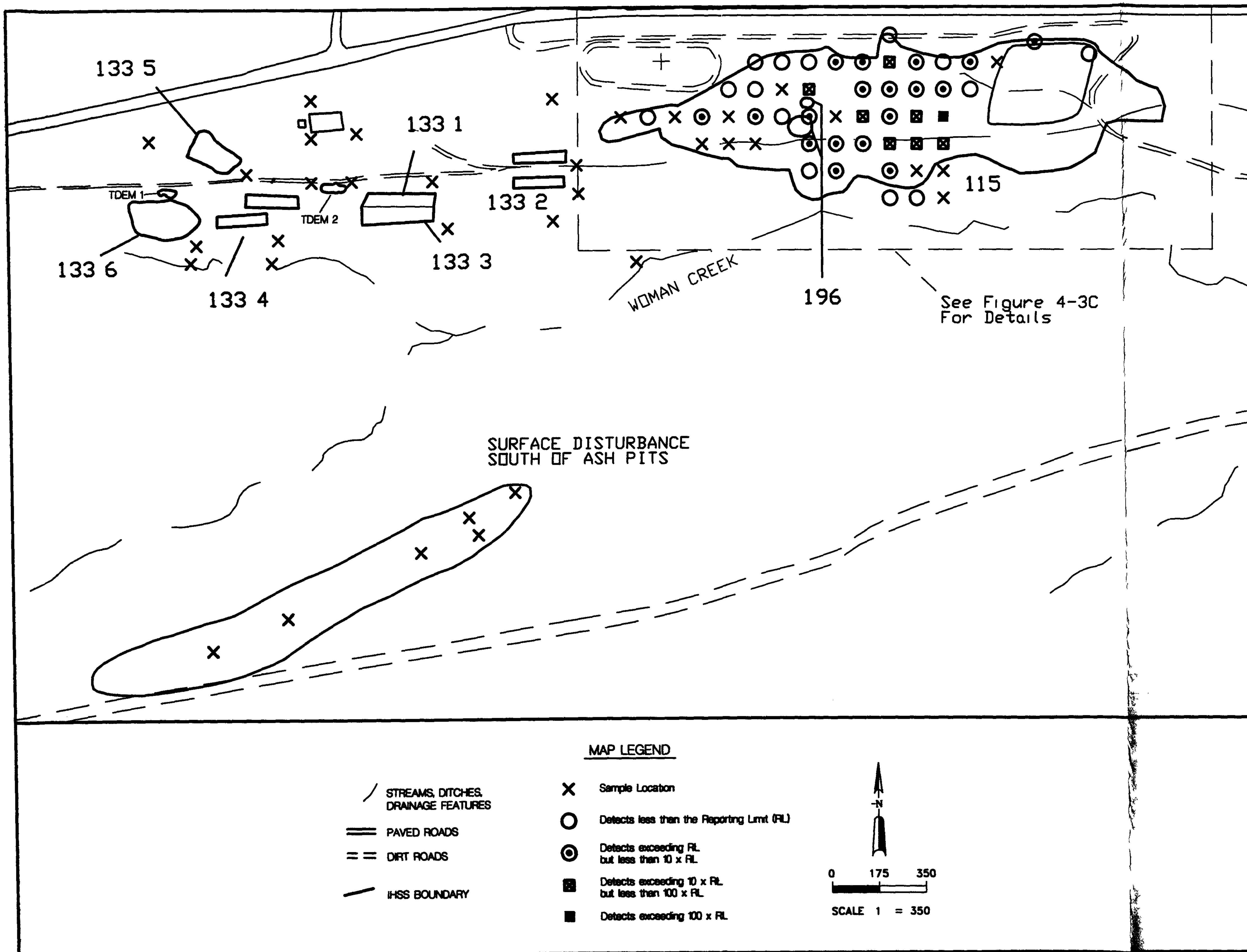
EXTENT OF RADIONUCLIDE COCs IN SURFACE SOIL IHSS 133

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-2D




Drawn JWH 9/30/95 Date
Checked 10/2/95 Date
Approved MRW 1 95 Date

FILE OU5 4 3A DWG

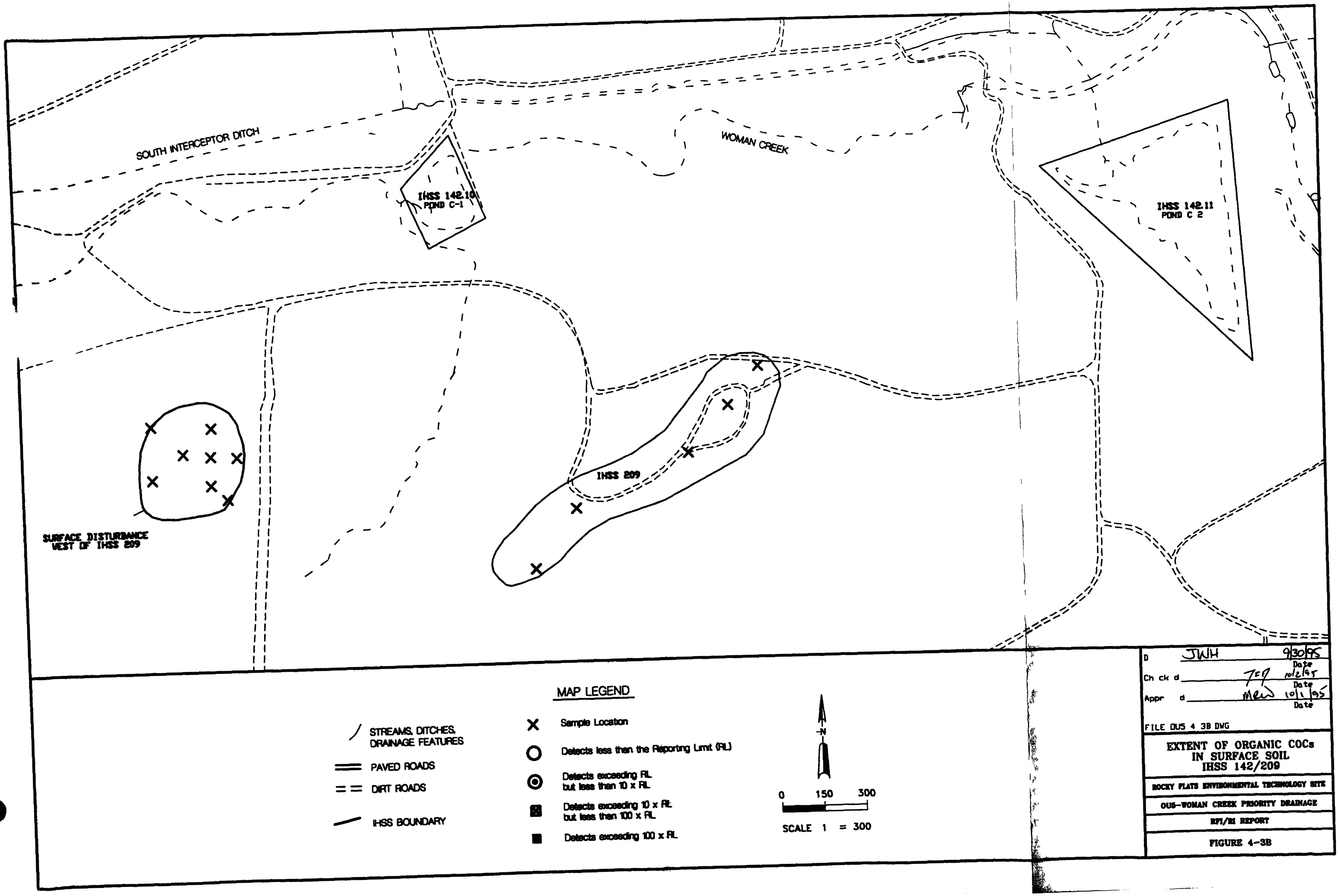
EXTENT OF ORGANIC COCs IN SURFACE SOIL

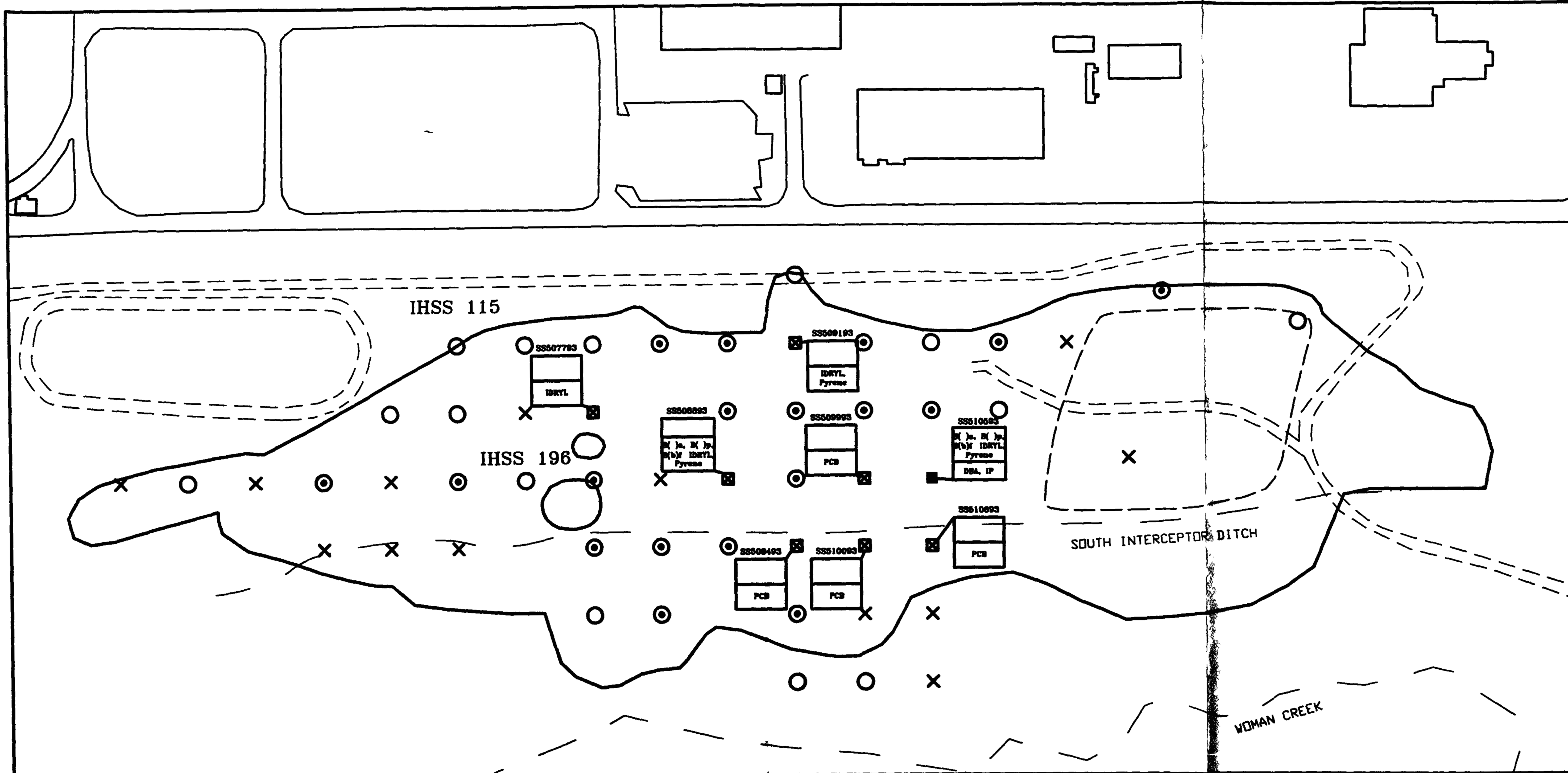
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-3A


SOUTH INTERCEPTOR DITCH
WOMAN CREEK
IHSS 142.10
POND C-1
IHSS 142.11
POND C 2
IHSS 209
SURFACE DISTURBANCE
WEST OF IHSS 209
MAP LEGEND
STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY
Sample Location
Detects less than the Reporting Limit (RL)
Detects exceeding RL but less than 10 x RL
Detects exceeding 10 x RL but less than 100 x RL
Detects exceeding 100 x RL
N
0
150
300
SCALE 1 = 300
D JWH 9/30/95 Date
Ch ck d 7E9 10/2/95 Date
Appr d MEW 10/1/95 Date
FILE OUS 4 3B DWG
EXTENT OF ORGANIC COCs
IN SURFACE SOIL
IHSS 142/209
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 4-3B




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- X Sample Location
- Detects less than the Reporting Limit (RL)
- Detects exceeding RL but less than 10 x RL
- Detects exceeding 10 x RL but less than 100 x RL
- Detects exceeding 100 x RL

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | RL (µg/kg) |
|---|---|---|
| PCB | Aroclor - 1254 | 160 |
| B(a)a | Benzo(a)anthracene | $30 |
| B(a)p | Benzo(a)Pyrene | $30 |
| B(b)f | Benzo(b)Fluoranthene | $30 |

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | RL (µg/kg) |
|---|---|---|
| DBA | Dibenzo(a h)anthracene | 330 |
| IDRYL | Fluoranthene | 330 |
| IP | Indeno(1 2 3-cd)Pyrene | 330 |
| Pyrene | Pyrene | 330 |

LOCATION

CONSTITUENTS 100 X RL

CONSTITUENTS 10 X RL AND 100 RL

0 75 150

SCALE 1 = 150

Dr wn JWH 10/3/95 Date

Check d TKF 10/3/95 Date

Appr ed MRW 10/10/95 Date

FILE OU5 4 3C DWG

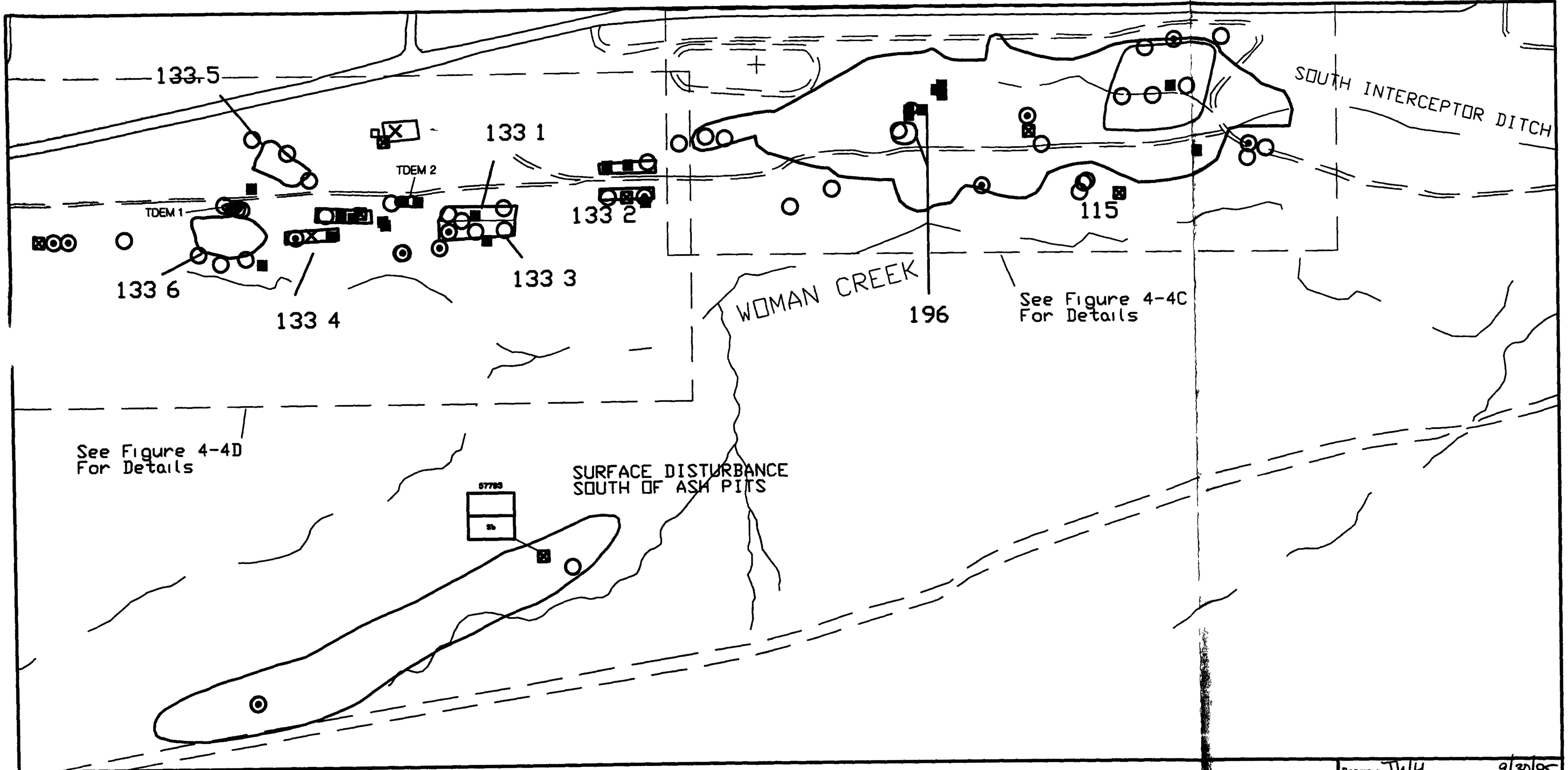
**EXTENT OF ORGANIC COCs IN SURFACE SOIL IHSS 115/196**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-3C




## MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

IHSS BOUNDARY

X < Background Mean (BM)

> BM and <= BM 1 STD DEV

> BM 1 STD DEV and <= BM 2 STD DEV

> BM 2 STD DEV and <= BM 3 STD DEV

> BM 3 STD DEV

LOCATION

CONSTITUENTS >BM+3 STD DEV

CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | MEAN (mg/kg) | STD. DEV |
|---|---|---|---|
| Sb | Antimony | 6 56 | 2 84 |
| Be | Beryllium | 4 66 | 4 77 |
| Cd | Cadmium | 0 64 | 0 24 |
| Cu | Copper | 12 59 | 12 77 |
| Mo | Molybdenum | 15 39 | 9 01 |
| Ni | Nickel | 19 81 | 20 56 |
| Ag | Silver | 5 70 | 9 40 |

N

0 175 350

SCALE 1" = 350

Drawn JWH 9/30/95 Date

Che k d [signature] 10/2/95 Date

Appro ed [signature] 1/10/95 Date

FILE OU5-4 4A.DWG

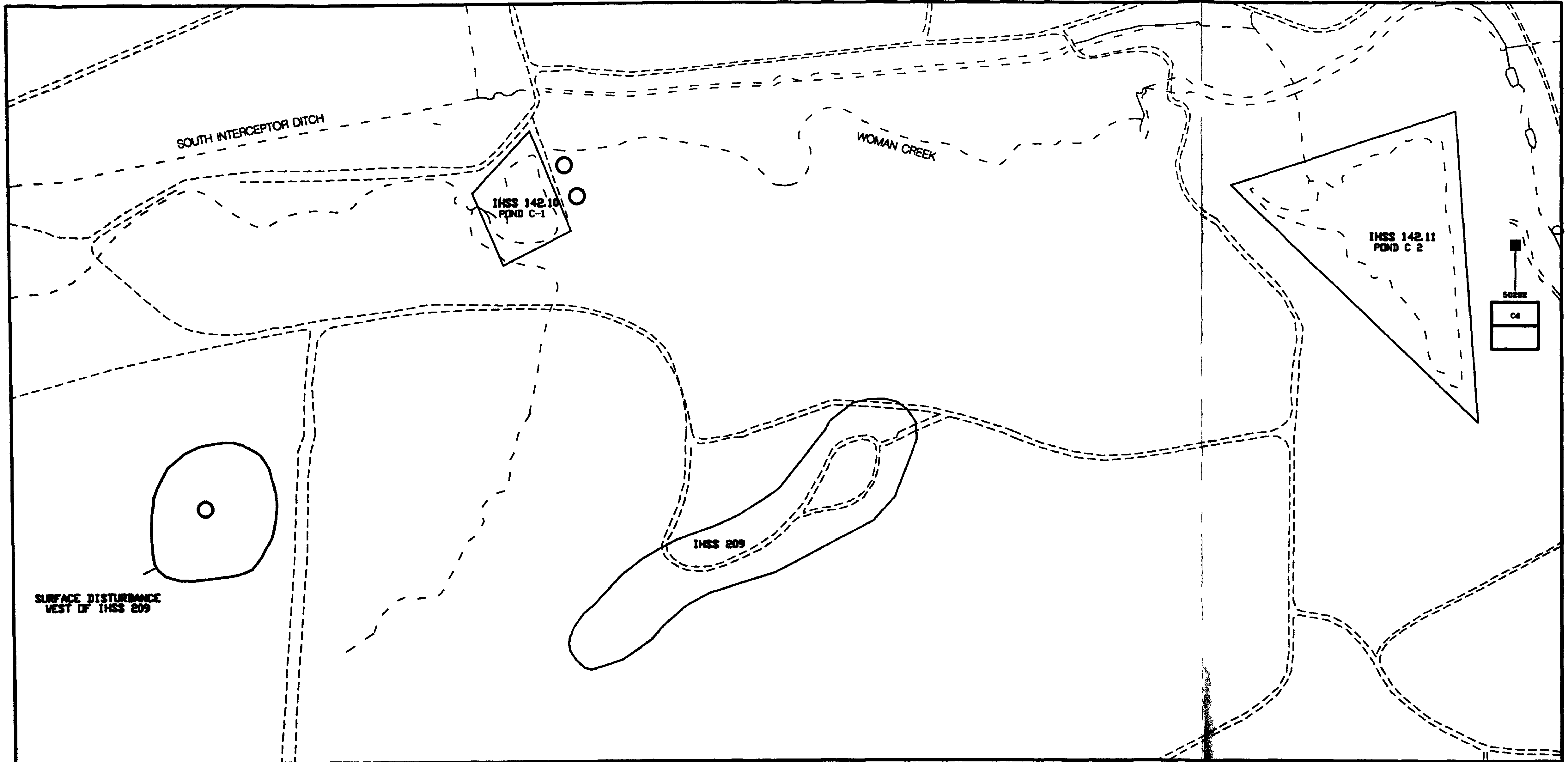
**EXTENT OF METAL COCs IN SUBSURFACE SOIL**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-4A




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

X <- Background Mean (BM)
> BM and <- BM 1 STD DEV
> BM 1 STD DEV and <- BM 2 STD DEV
> BM 2 STD DEV and <- BM 3 STD DEV
> BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (mg/kg) | STD. DEV |
|---|---|---|---|
| Sb | Antimony | 6 56 | 2 84 |
| Be | Beryllium | 4 66 | 4 77 |
| Cd | Cadmium | 0 64 | 0 24 |
| Cu | Copper | 12 59 | 12 77 |
| Mo | Molybdenum | 15 39 | 9 01 |
| Ni | Nickel | 19 81 | 20 56 |
| Ag | Silver | 5 70 | 9 40 |

N

0 150 300

SCALE 1" = 300

Dr n JWH 9/30/95 Date
Ch k d [illegible] 10/2/95 Date
Appro d MRW 10/10/95 Date

FILE OU5 4 4B DWG

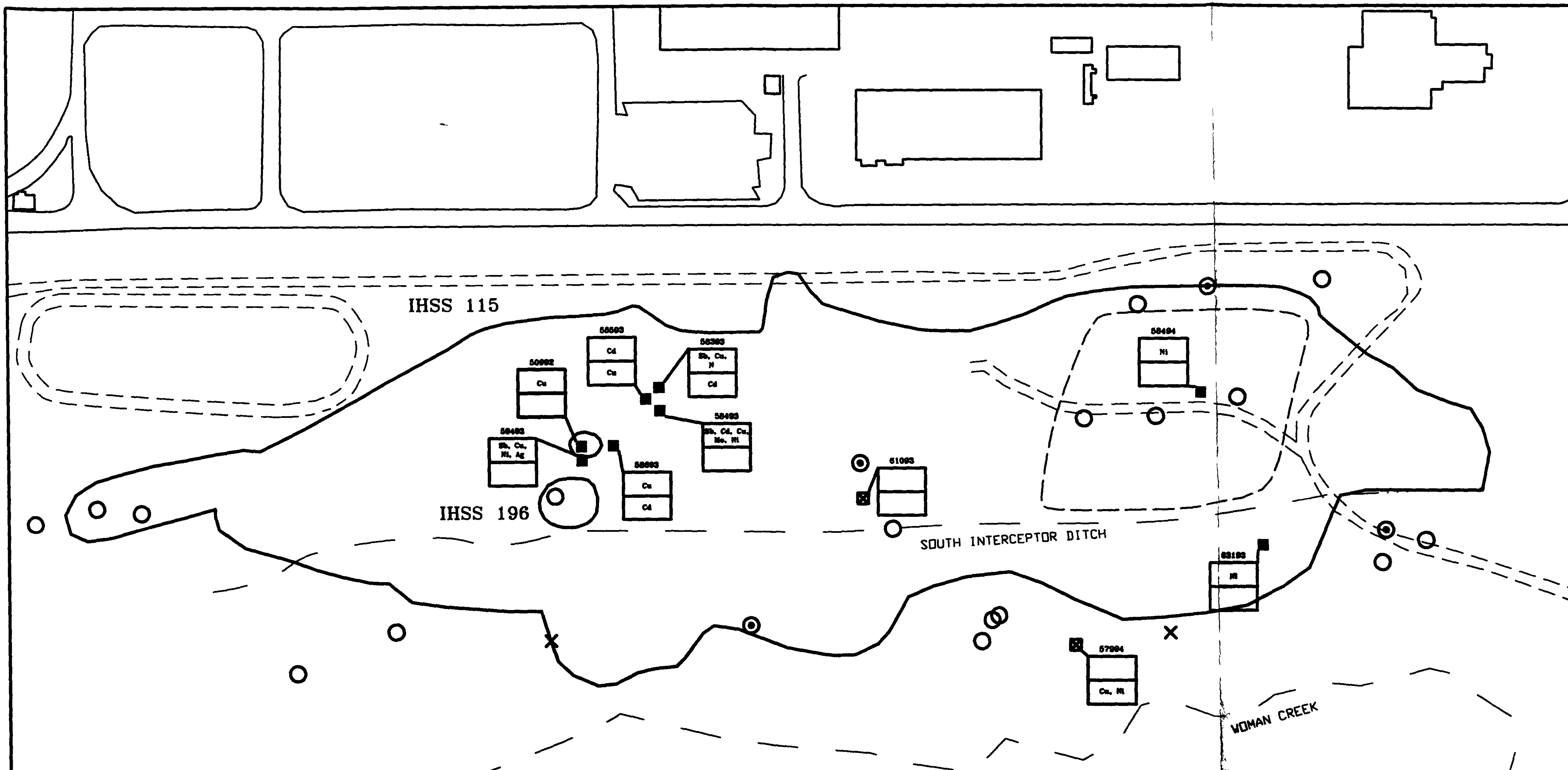
EXTENT OF METAL COCs IN SUBSURFACE SOIL IHSS 142/209

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-4B




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- X < Background Mean (BM)
- ○ > BM and <- BM 1 STD DEV
- ◎ > BM 1 STD DEV and < BM 2 STD DEV
- ▩ > BM 2 STD DEV and < BM 3 STD DEV
- ■ > BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS BM+2 STD DEV AND <=BM+3 STD DEV

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | MEAN (mg/kg) | STD. DEV |
|---|---|---|---|
| Sb | Antimony | 6 56 | 2 84 |
| Be | Beryllium | 4 66 | 4 77 |
| Cd | Cadmium | 0 64 | 0 24 |
| Cu | Copper | 12 59 | 12 77 |
| Mo | Molybdenum | 15 39 | 9 01 |
| Ni | Nickel | 19 81 | 20 56 |
| Ag | Silver | 5 70 | 9 40 |

N

0 75 150

SCALE 1 150

Dr n JWH 9/30/95 Date
Checked 7[illegible] 10/2/95 Date
Appr v d MQW 10/10/95 Date

FILE OU5 4 4C DWG

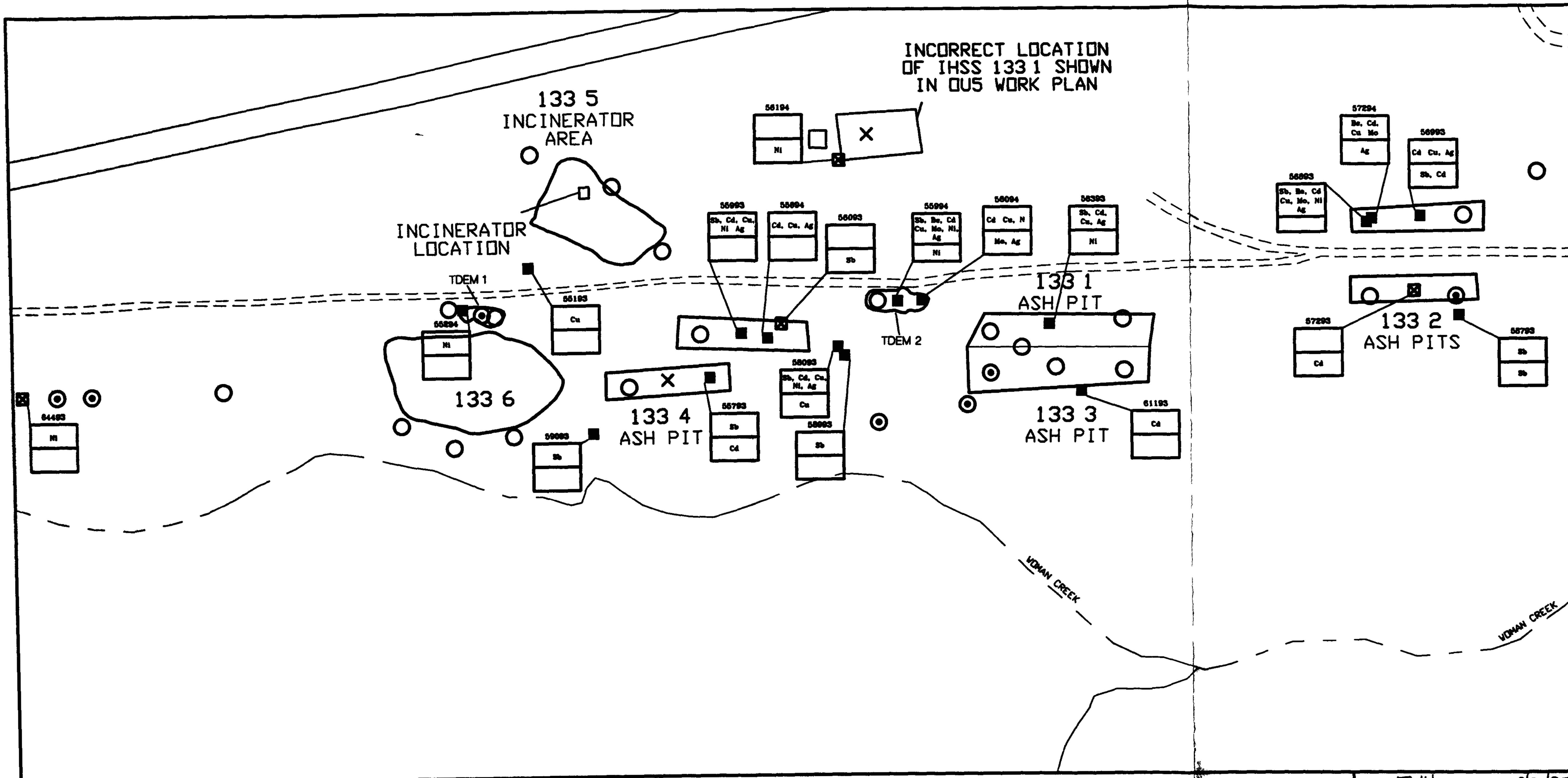
**EXTENT OF METAL COCs IN SUBSURFACE SOIL IHSS 115/196**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-4C




MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- X < Background Mean (BM)
- ○ > BM and < BM 1 STD DEV
- ◎ > BM 1 STD DEV and <- BM 2 STD DEV
- ⊠ > BM 2 STD DEV and <- BM 3 STD DEV
- ■ > BM 3 STD DEV

LOCATION

| CONSTITUENTS >BM+3 STD DEV |
|---|
| CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV |

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (mg/kg) | STD. DEV |
|---|---|---|---|
| Sb | Antimony | 6 56 | 2 84 |
| Be | Beryllium | 4 66 | 4 77 |
| Cd | Cadmium | 0 64 | 0 24 |
| Cu | Copper | 12 59 | 12 77 |
| Mo | Molybdenum | 15 39 | 9 01 |
| Ni | Nickel | 19 81 | 20 56 |
| Ag | Silver | 5 70 | 9 40 |

0 75 150
SCALE 1 = 150

Dr JWH 9/30/95 Date
Check d [signature] 10/2/95 Date
Appr d MRW 10/10/95 Date

FILE OU5 4 4D.DWG

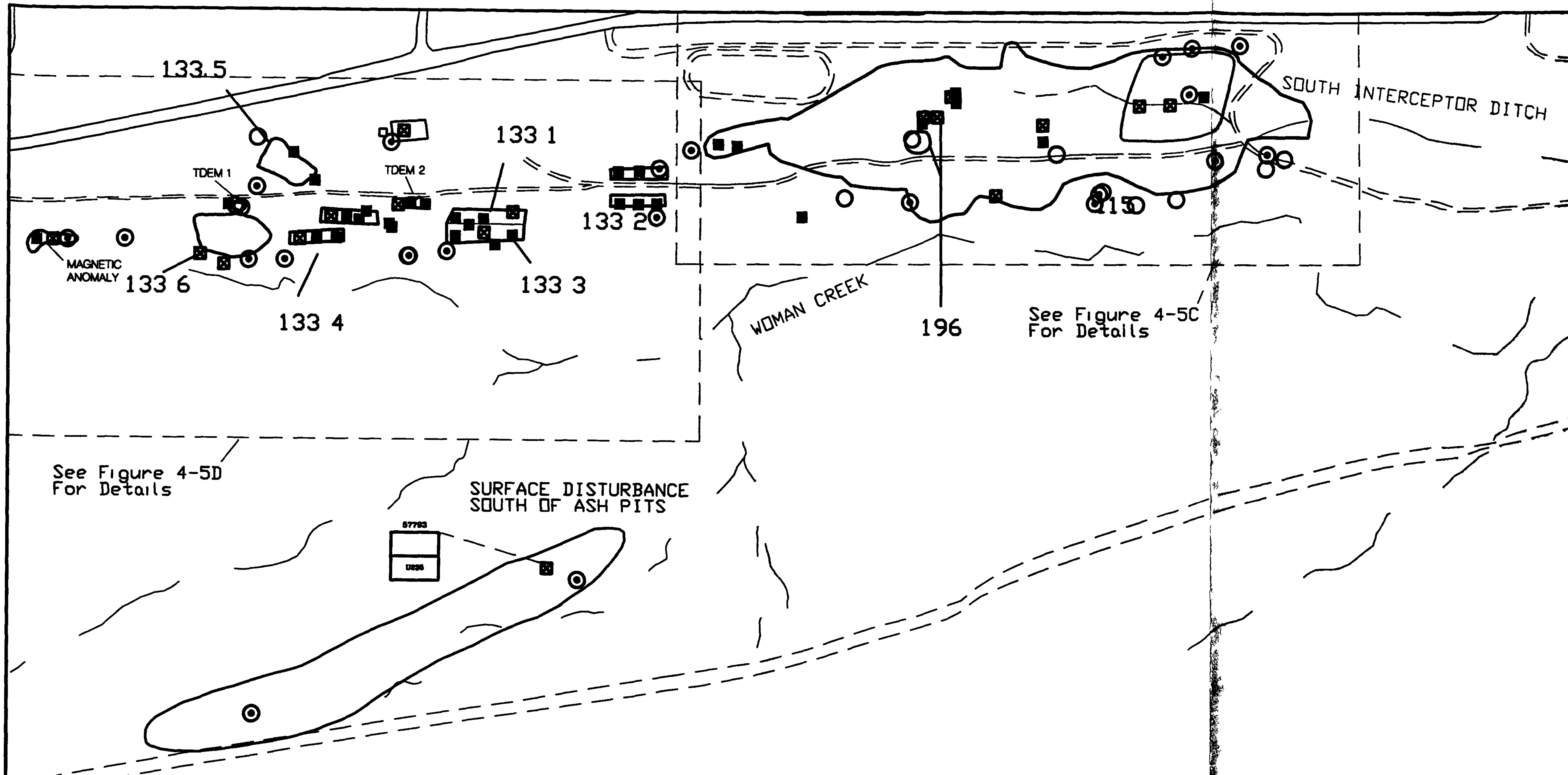
EXTENT OF METAL COCs IN SUBSURFACE SOIL IHSS 133

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5–WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-4D




## MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

IHSS BOUNDARY

× < Background Mean (BM)

> BM and < BM 1 STD DEV

> BM 1 STD DEV and < BM 2 STD DEV

> BM 2 STD DEV and < BM 3 STD DEV

> BM 3 STD DEV

LOCATION

CONSTITUENTS BM+3 STD DEV

CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

Note: Constituents occurring in different concentrations at the same location represent samples from different depths.

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | MEAN (pCi/g) | STD. DEV |
|---|---|---|---|
| U233/234 | Uranium 233/234 | 0 779 | 0 932 |
| U235 | Uranium 235 | 0 022 | 0 046 |
| U238 | Uranium 238 | 0 733 | 0 376 |

0 175 350

SCALE 1" = 350

Drawn JWH 9/30/95 Date

Checked [signature] 10/2/95 Date

Approved [signature] 10/10/95 Date

FILE OU5-4 5A.DWG

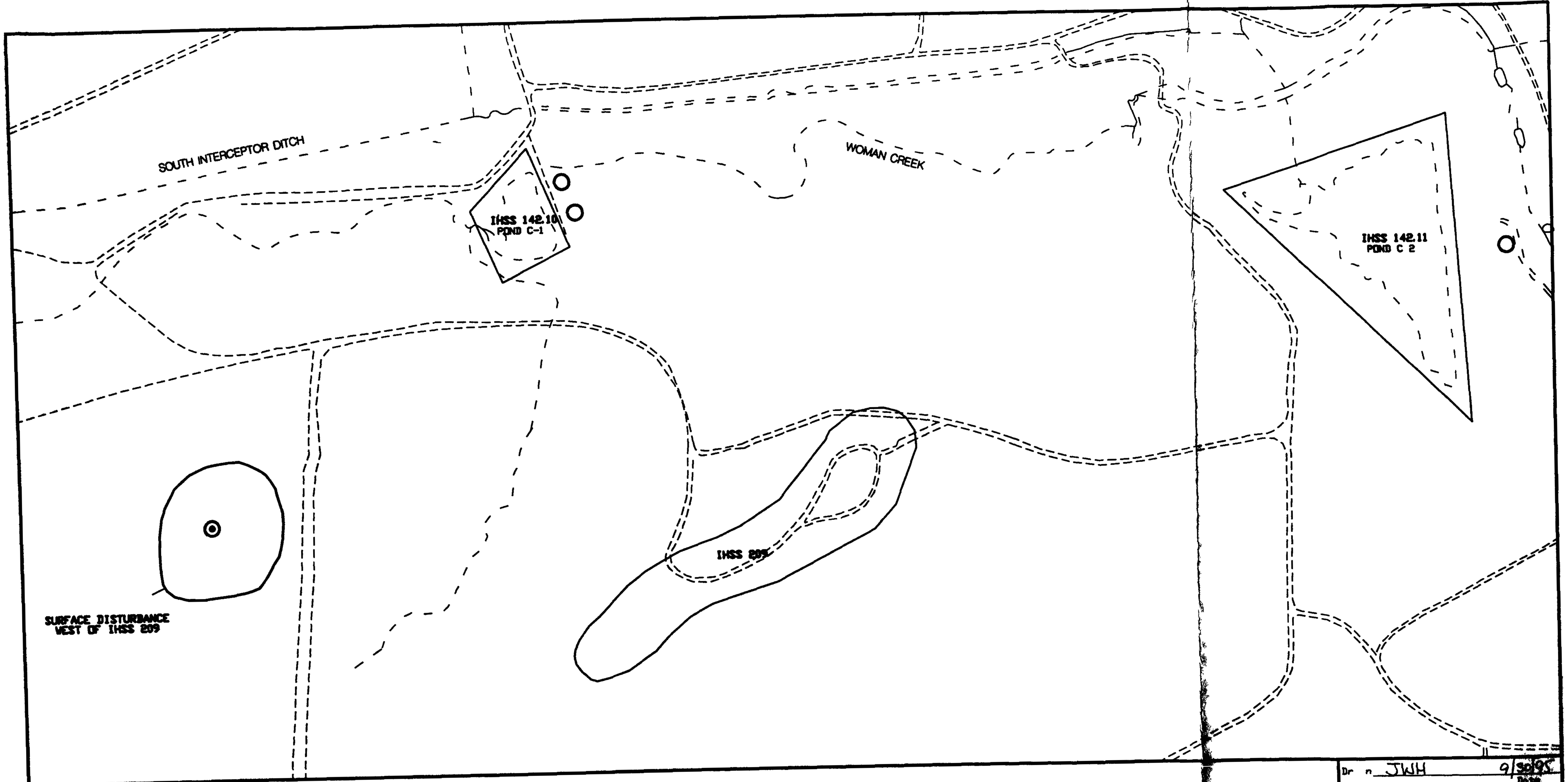
**EXTENT OF RADIONUCLIDE COCs IN SUBSURFACE SOIL**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-5A




## MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

IHSS BOUNDARY

X < Background Mean (BM)

○ > BM and < BM 1 STD DEV

◎ > BM 1 STD DEV and <- BM 2 STD DEV

▣ > BM 2 STD DEV and < BM 3 STD DEV

■ > BM 3 STD DEV

LOCATION

| |
|---|
| CONSTITUENTS >BM+3 STD DEV |
| CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV |

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

### BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (pCi/g) | STD. DEV |
|---|---|---|---|
| U233/234 | Uranium 233/234 | 0 779 | 0 932 |
| U235 | Uranium 235 | 0 022 | 0 046 |
| U238 | Uranium 238 | 0 733 | 0 376 |

N

0 150 300

SCALE 1" = 300

Dr n JWH 9/30/95 Date

Ch k d [illegible] , [illegible] Date

Appr d MRW 10/10/95 Date

FILE OU5 4 5B DWG

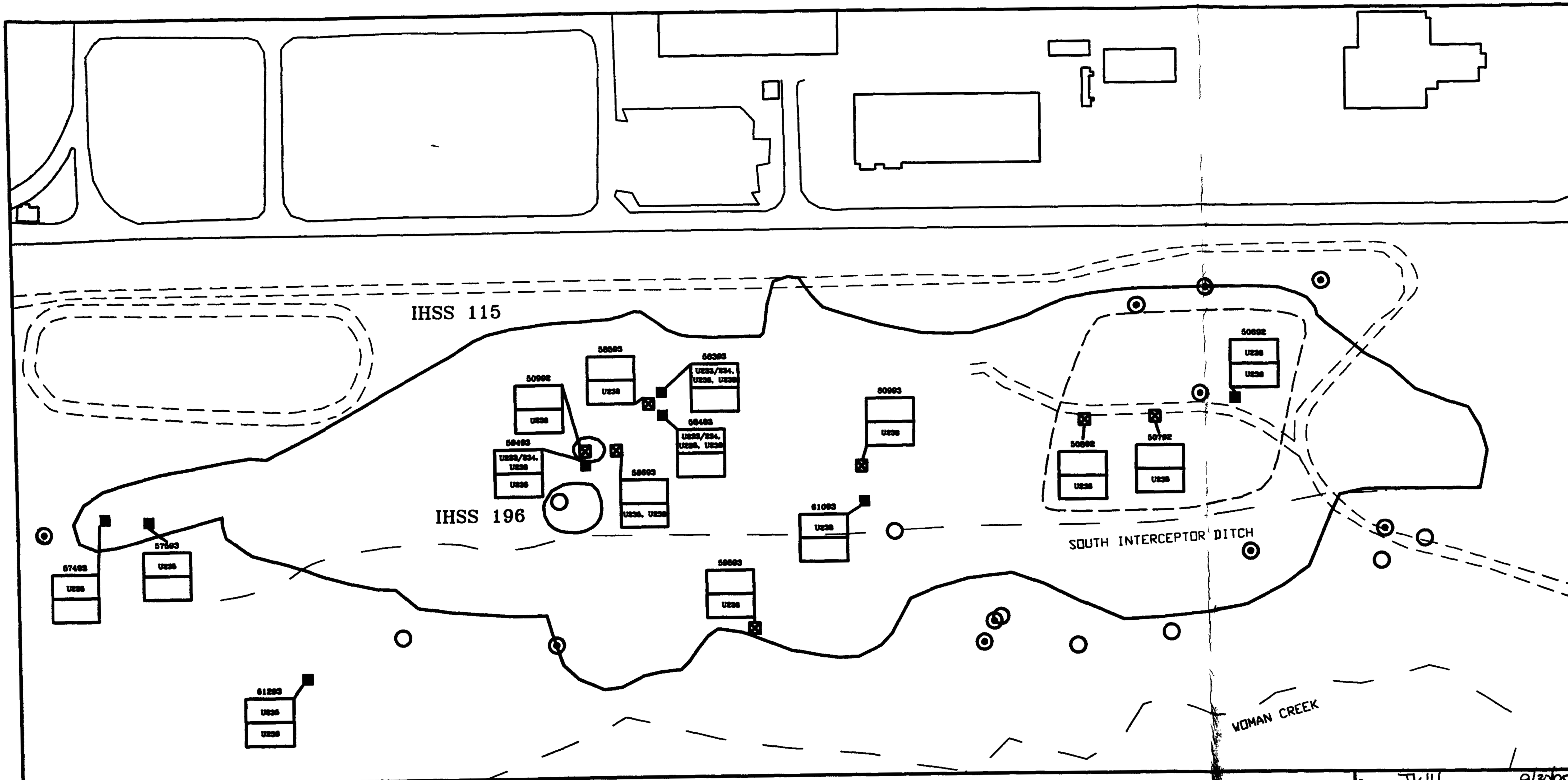
**EXTENT OF RADIONUCLIDE COCs IN SUBSURFACE SOIL IHSS 142/209**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-5B




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- ✕ < Background Mean (BM)
- ○ > BM and <= BM 1 STD DEV
- ◉ > BM 1 STD DEV and < BM 2 STD DEV
- ⊠ > BM 2 STD DEV and < BM 3 STD DEV
- ■ > BM 3 STD DEV

LOCATION

| |
|---|
| CONSTITUENTS >BM+3 STD DEV |
| CONSTITUENTS BM+2 STD DEV AND <=BM+3 STD DEV |

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

### BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (pCi/g) | STD. DEV |
|---|---|---|---|
| U233/234 | Uranium 233/234 | 0 779 | 0 932 |
| U235 | Uranium 235 | 0 022 | 0 046 |
| U238 | Uranium 238 | 0 733 | 0 376 |

0 75 150

SCALE 1" = 150

Dr wn JWH 9/30/95 Date
Che k d TEP 10/2/95 Date
Appr d MRW 10/10/95 Date

FILE OU5 4 5C DWG

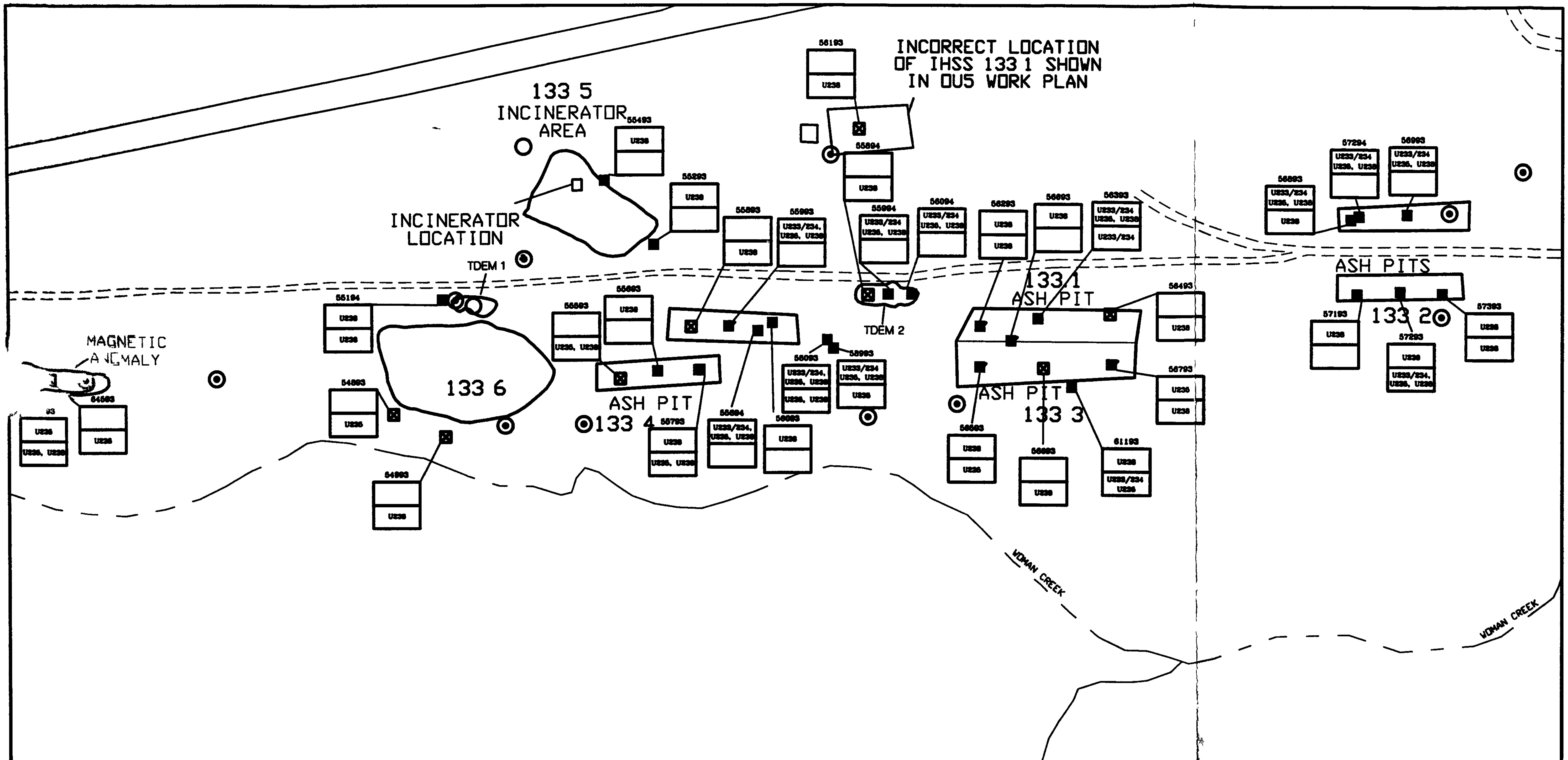
# EXTENT OF RADIONUCLIDE COCs IN SUBSURFACE SOIL IHSS 115/196

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-5C




MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- X < Background Mean (BM)
- ○ > BM and <- BM 1 STD DEV
- ◎ > BM 1 STD DEV and < BM 2 STD DEV
- ⊠ > BM 2 STD DEV and <- BM 3 STD DEV
- ■ > BM 3 STD DEV

| LOCATION |
| --- |
| CONSTITUENTS >BM+3 STD DEV |
| CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV |

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (pCi/g) | STD. DEV |
| --- | --- | --- | --- |
| U233/234 | Uranium 233/234 | 0 779 | 0 932 |
| U235 | Uranium 235 | 0 022 | 0 046 |
| U238 | Uranium 238 | 0 733 | 0 376 |

N

0 75 150

SCALE 1" = 150

Dr n JWH 9/30/95 Date
Che k d TJP 10/3/95 Date
Appr ed MEW 10/10/95 Date

FILE OU5 4 5D DWG

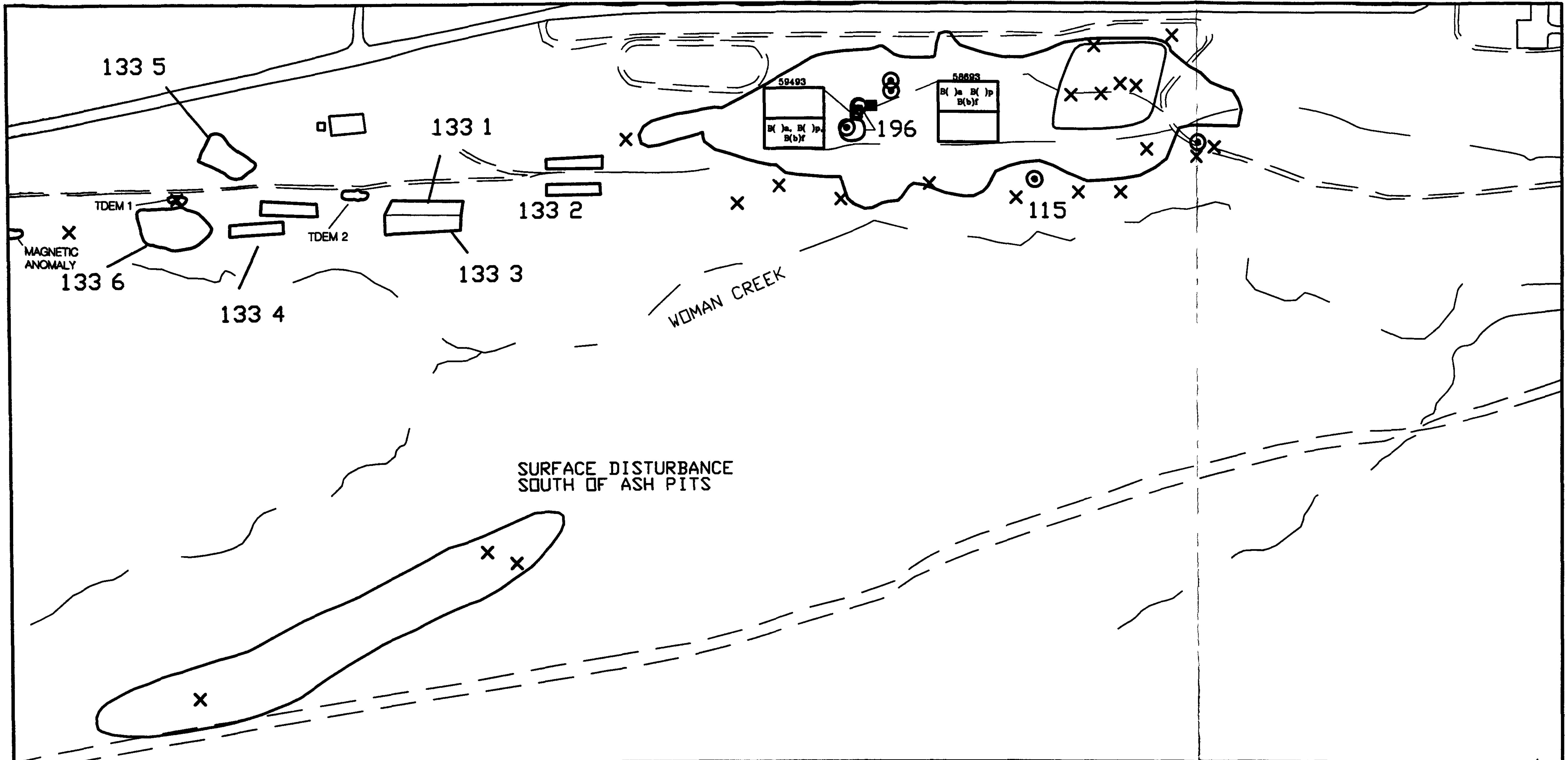
**EXTENT OF RADIONUCLIDE COCs IN SUBSURFACE SOIL IHSS 133**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-5D




## MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

Sample Location
Detects less than the Reporting Limit (RL)
Detects exceeding RL but below 10 x RL
Detects exceeding 10 x RL but below 100 x RL
Detects exceeding 100 x RL

LOCATION
CONSTITUENTS 100 RL
CONSTITUENTS 10 RL AND = 100 RL

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

### BACKGROUND DATA

| SYMBOL | CONSTITUENT | Reporting Limit (RL) µg/kg |
|---|---|---|
| PCB | Aroclor-1254 | 160 |
| B(a)a | Benzo( )anthracene | 330 |
| B( )p | Benzo( )Pyrene | 330 |
| B(b)f | Benzo(b)Fluoranthene | 330 |
| DBA | Dibenzo(a,h)anthracene | 330 |
| IDRYL | Fluoranthene | 330 |
| IP | Indeno(1,2,3-cd)Pyrene | 330 |
| Pyrene | Pyrene | 330 |

N

0 175 350

SCALE 1 = 350

Drawn JWH 9/30/95 Date
Checked [signature] 10/3/95 Date
Approved MEW 10/10/95 Date

FILE OU5 4 6A DWG

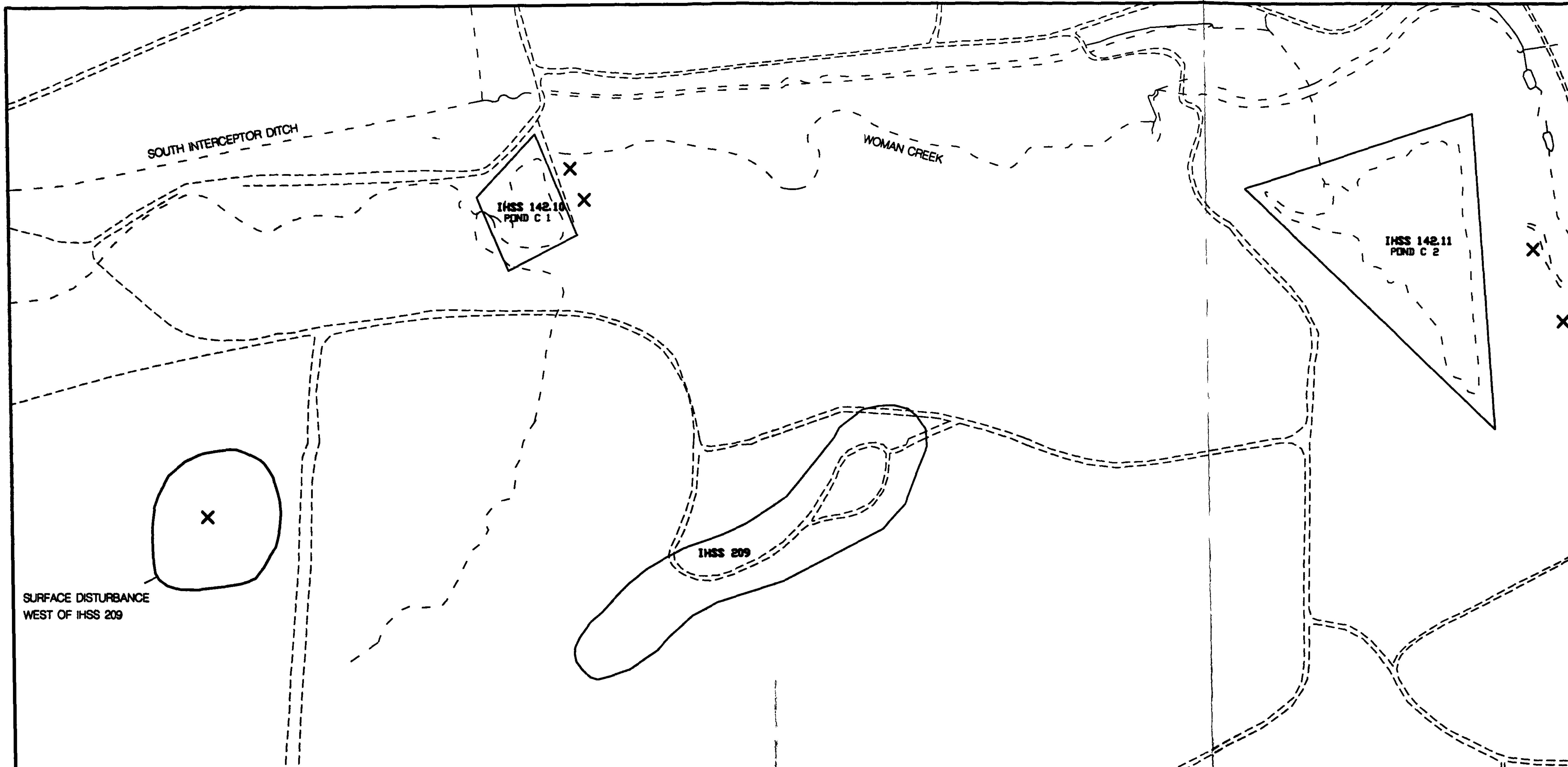
**EXTENT OF ORGANIC COCs IN SUBSURFACE SOIL**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-6A




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

IHSS BOUNDARY

× Sample Location

○ Detects less than the Reporting Limit (RL)

◎ Detects exceeding RL but below 10 x RL

Detects exceeding 10 x RL but below 100 x RL

■ Detects exceeding 100 x RL

LOCATION

| |
|---|
| CONSTITUENTS 160 RL |
| CONSTITUENTS 10 RL AND <= 00 RL |

Note: Constituents occuring in different concentrations at the same location represent samples from different depths.

BACKGROUND DATA

| SYMBOL | CONSTITUENT | Reporting Limit (RL) µg/kg |
|---|---|---|
| PCB | Aroclor-1254 | 160 |
| B( )a | Benzo( )anthracene | 330 |
| B( )p | Benzo( )Pyrene | 330 |
| B(b)F | Benzo(b)Fluoranthene | 330 |
| DBA | Dibenzo(a,h)anthracene | 330 |
| IDRYL | Fluoranthene | 330 |
| IP | Indeno(1,2,3-cd)Pyrene | 330 |
| Pyrene | Pyrene | 330 |

N

0 150 300

SCALE 1 = 300

D JWH 10/2/95 Date

Ch k d 7=7 10/3/95 Date

Appro d MEW 10/10/95 Date

FILE OU5 4 6B DWG

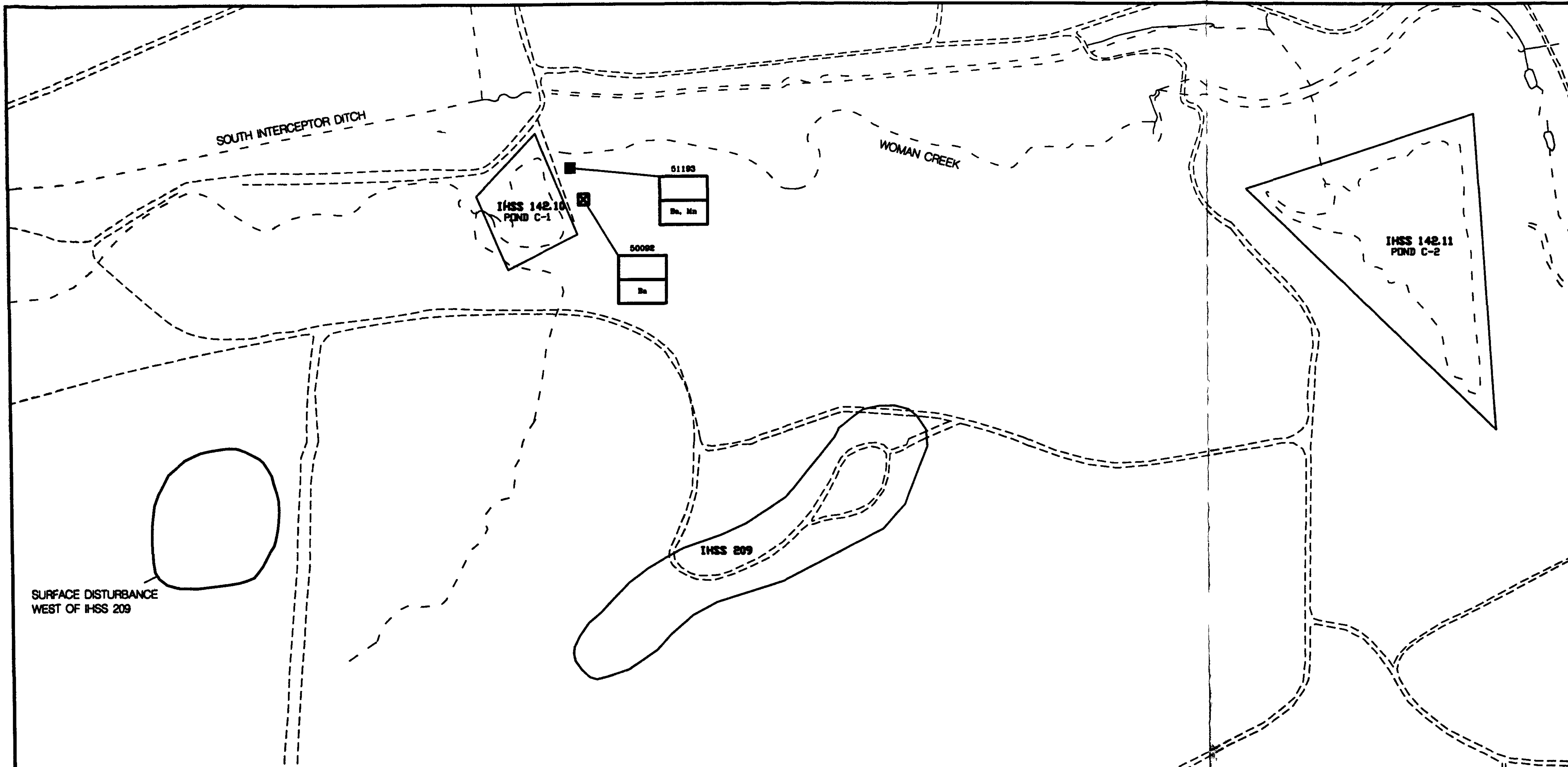
EXTENT OF ORGANIC COCs IN SUBSURFACE SOIL IHSS 142/209

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-6B




## MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

X < Background Mean (BM)
> BM and < BM 1 STD DEV
> BM 1 STD DEV and <- BM 2 STD DEV
> BM 2 STD DEV and <- BM 3 STD DEV
> BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

Note: Constituents occurring in different concentrations at the same location represent samples collected on different dates.

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (µg/l) | STD DEV |
|---|---|---|---|
| Al | Dissolved Aluminum | 113 66 | 594 80 |
| Ba | Dissolved Barium | 84 00 | 33 10 |
| Mn | Dissolved Manganese | 32 66 | 87 43 |

N

0 150 300

SCALE 1 = 300

Drawn JWH 10/2/95 Date
Checked TEA 10/3/95 Date
Approved MEW 10/10/95 Date

FILE OU5 4 7B.DVG

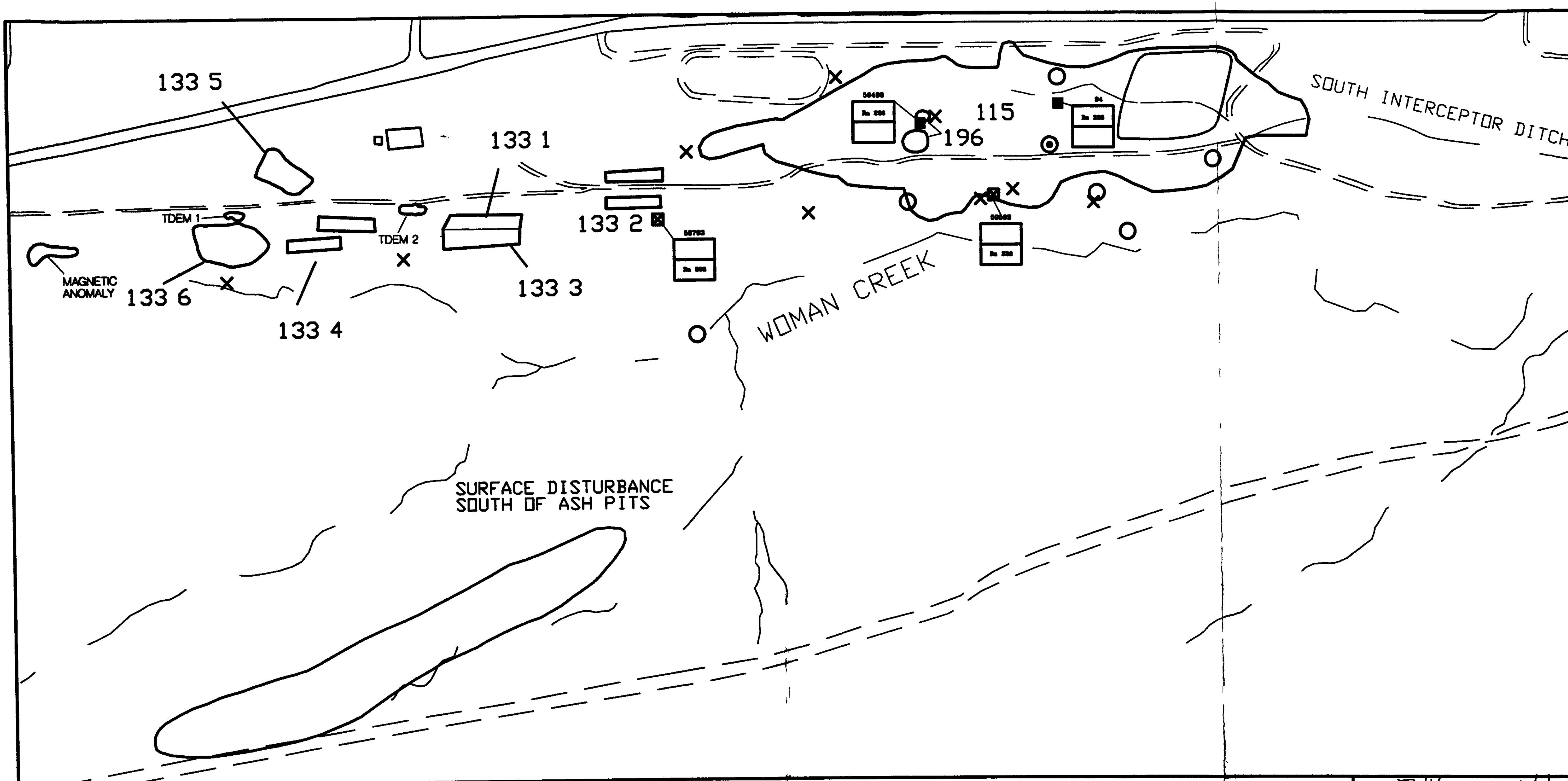
EXTENT OF DISSOLVED METAL COCs IN GROUNDWATER IHSS 142/209

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-7B




## MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

- ✕ < Background Mean (BM)
- ○ > BM and < BM 1 STD DEV
- ◉ > BM 1 STD DEV and <- BM 2 STD DEV
- ⊠ > BM 2 STD DEV and < BM 3 STD DEV
- ■ > BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

Note: Constituents occurring in different concentrations at the same location represent samples collected on different dates.

### BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (pCi/l) | STD DEV |
|---|---|---|---|
| U233/234 | Dissolved U233/234 | 6 914 | 25 440 |
| U235 | Dissolved U235 | 0 20 | 0 640 |
| U238 | Dissolved U238 | 4 832 | 17 670 |
| Am241 | Dissolved Am241 | 0 011 | 0 010 |
| Ra226 | Dissolved Ra226 | 0 258 | 0 110 |

N

0 175 350

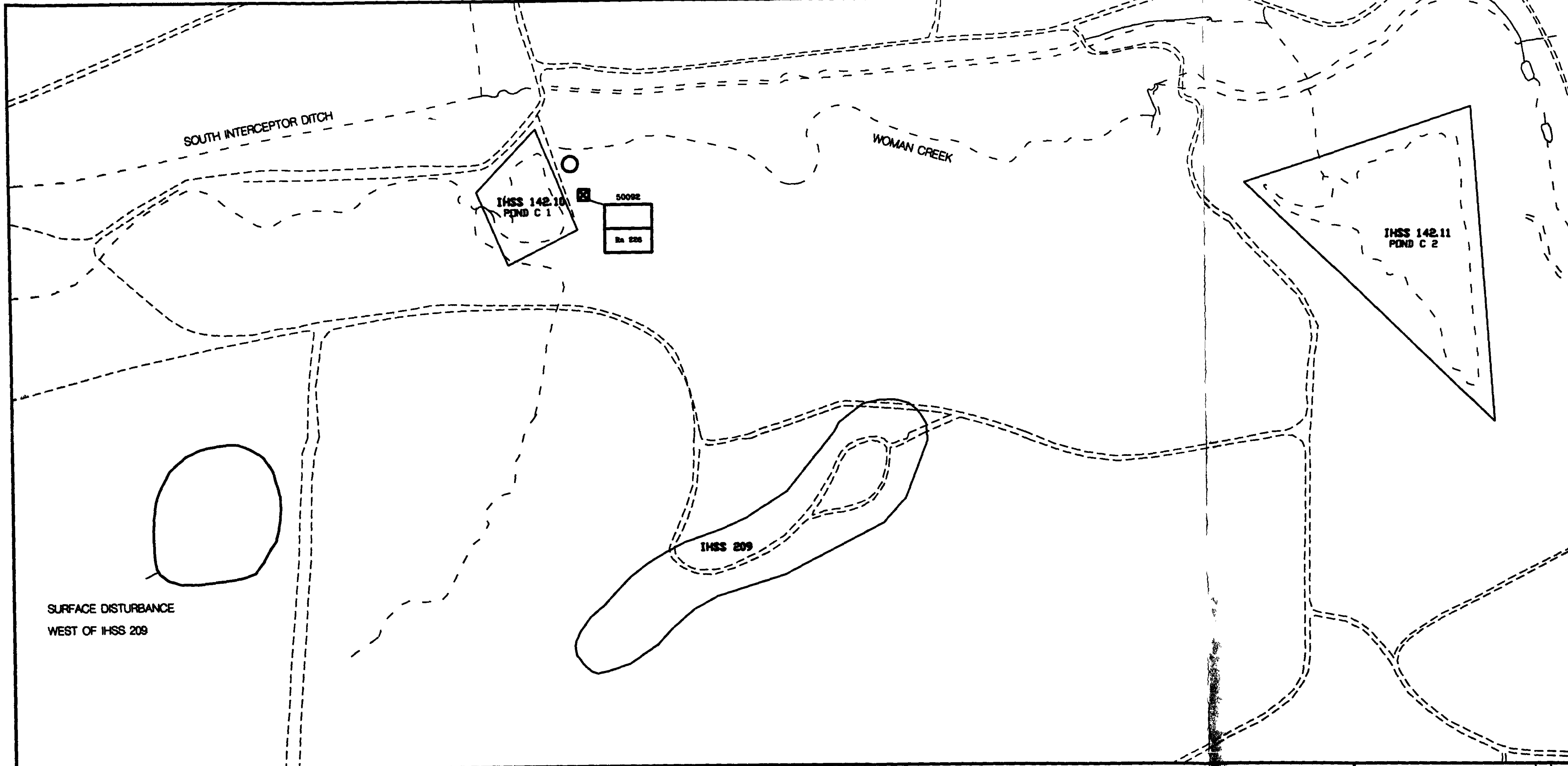
SCALE 1 = 350

Drawn JWH 10/2/95 Date
Checked TEQ 10/3/95 Date
Approved MEW 10/10/95 Date

FILE OU5 4 8A DWG

**EXTENT OF DISSOLVED RADIONUCLIDE COCs IN GROUNDWATER**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 4-8A




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

< Background Mean (BM)
> BM and < BM 1 STD DEV
> BM 1 STD DEV and < BM 2 STD DEV
> BM 2 STD DEV and < BM 3 STD DEV
> BM 3 STD DEV

LOCATION
CONSTITUENTS >BM+3 STD DEV
CONSTITUENTS BM+0 STD DEV AND <=BM+3 STD DEV

Note: Constituents occurring in different concentrations at the same location represent samples collected on different dates.

BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (pCi/l) | STD DEV |
|---|---|---|---|
| U233/234 | Dissolved U233/234 | 6 914 | 25 440 |
| U235 | Dissolved U235 | 0.20 | 0 640 |
| U238 | Dissolved U238 | 4 832 | 17 670 |
| Am241 | Dissolved Am241 | 0 011 | 0 010 |
| Ra226 | Dissolved Ra226 | 0 258 | 0 110 |

N
150 300
SCALE 1 = 300

D n JWH 10/2/95 Date
Ch cked 10/3/95 Date
Appr ed MEW 10/10/95 Date
FILE OU5 4 8B DWG

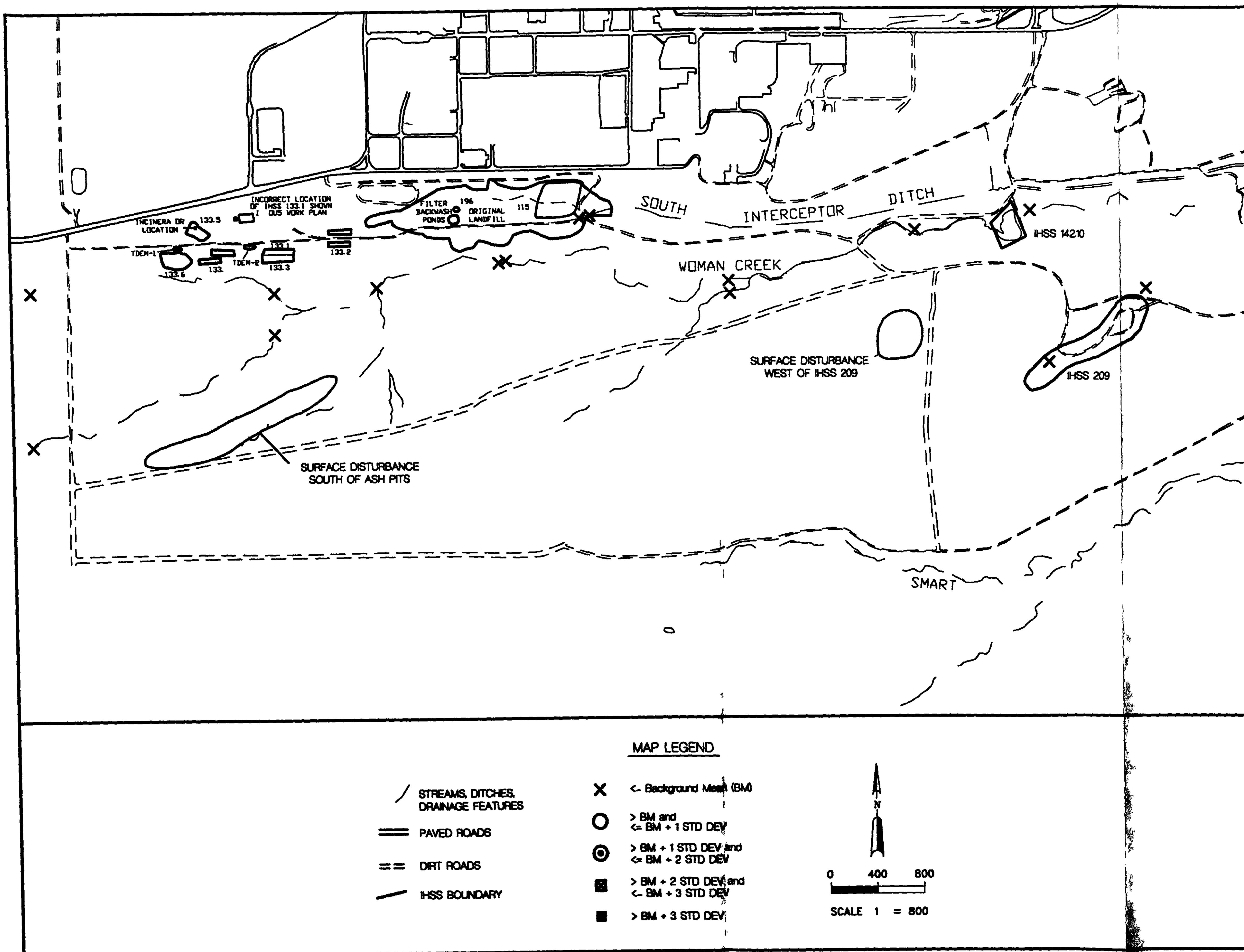
EXTENT OF DISSOLVED RADIONUCLIDE COCs IN GROUNDWATER IHSS 142/209

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 4-8B




Dr JWH 10/3/95
Date
Check d TZM 10/3/95
Date
Approved MEW 10/10/95
Date

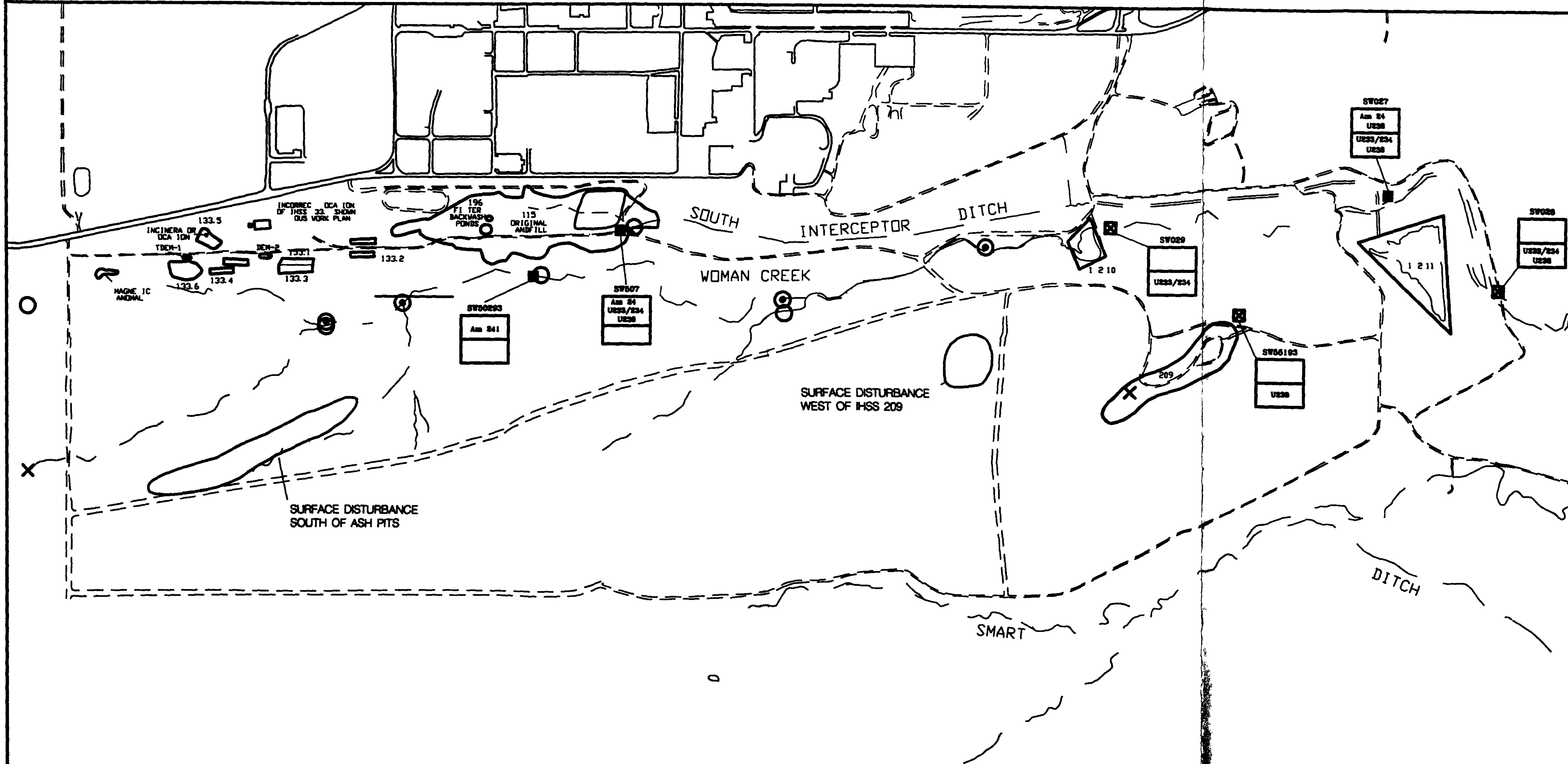
FILE OU5 4 9 DWG

EXTENT OF METAL COCs
IN SURFACE WATER

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT

FIGURE 4-9




## MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

IHSS BOUNDARY

< Background Mean (BM)

> BM and < BM 1 STD DEV

> BM 1 STD DEV and <- BM 2 STD DEV

> BM 2 STD DEV and < BM 3 STD DEV

> BM 3 STD DEV

LOCATION

CONSTITUENTS BM+3 STD DEV

CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV

Note: Constituents occurring in different concentrations at the same location represent samples collected on different dates.

### BACKGROUND DATA

| SYMBOL | CONSTITUENT | MEAN (pCi/l) | STD DEV |
|---|---|---|---|
| Am241 | Total Am241 | 0 0039 | 0 0060 |
| U233/234 | Total U233/234 | 0 4862 | 0 5500 |
| U238 | Total U238 | 0 3642 | 0.4320 |

N

400 800

SCALE 1 = 800

Dr n JWH 10/3/95 Date

Checked TEP 10/3/95 Date

Appr ed MEW 10/10/95 Date

FILE OU5 4 10.DWG

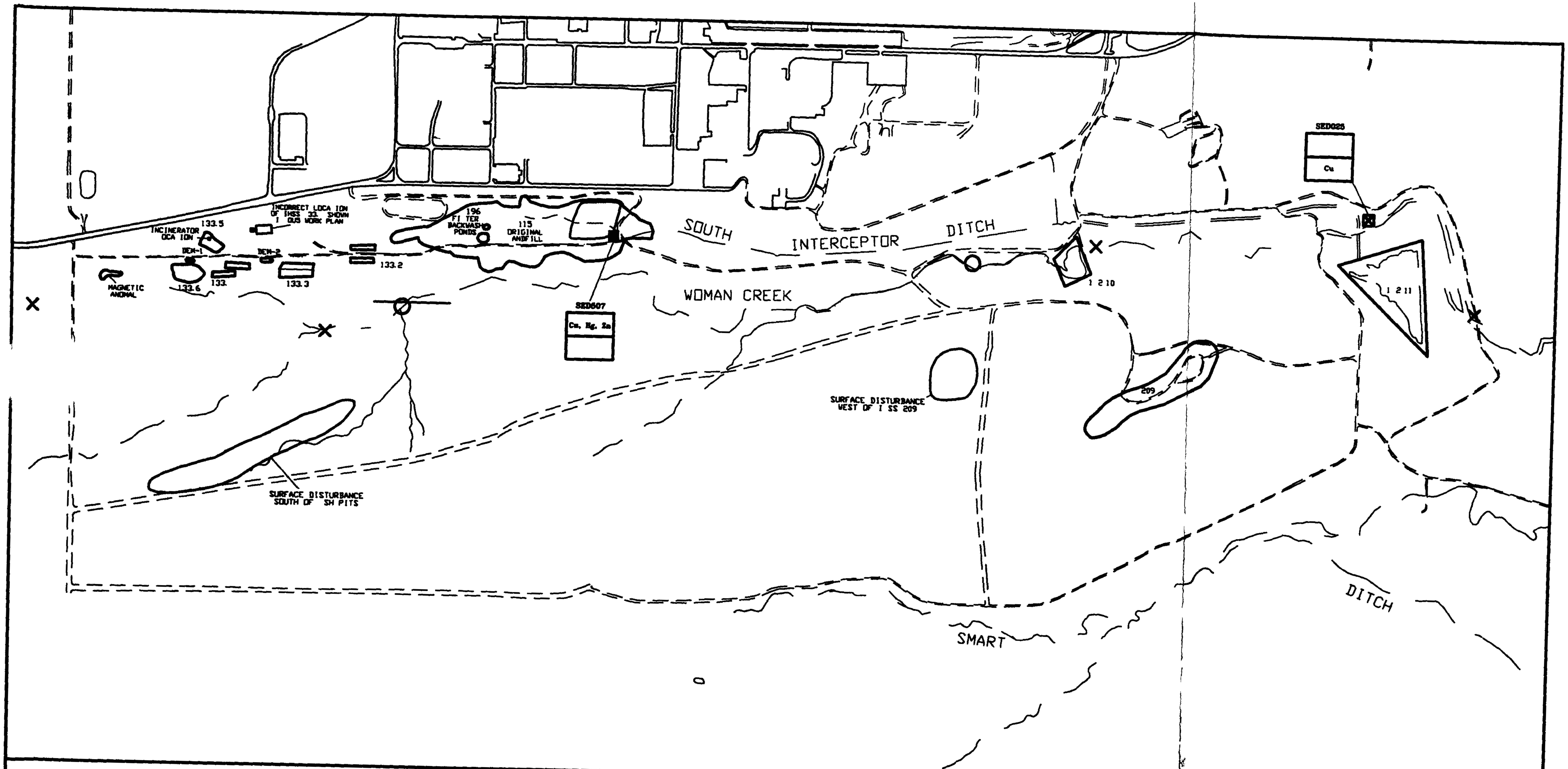
**EXTENT OF TOTAL RADIONUCLIDE COCs IN SURFACE WATER**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

**FIGURE 4-10**




## MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- IHSS BOUNDARY

- X < Background Mean (BM)
- ○ > BM and <- BM 1 STD DEV
- ◎ > BM 1 STD DEV and <- BM 2 STD DEV
- ▩ > BM 2 STD DEV and < BM 3 STD DEV
- ■ > BM 3 STD DEV

LOCATION

| |
|---|
| CONSTITUENTS >BM+3 STD DEV |
| CONSTITUENTS >BM+2 STD DEV AND <=BM+3 STD DEV |

**BACKGROUND DATA**

| SYMBOL | CONSTITUENT | MEAN (mg/kg) | STD DEV |
|---|---|---|---|
| Cu | Copper | 10 24 | 7 77 |
| Hg | Mercury | 0 09 | 0 06 |
| Zn | Zinc | 53.56 | 63 06 |

N

0 400 800

SCALE 1 = 800

Dr wn JWH 10/3/95 Date
Check d [signature] 10/3/95 Date
Appr ved [signature] 10/10/95 Date

FILE OU5 4 11 DWG

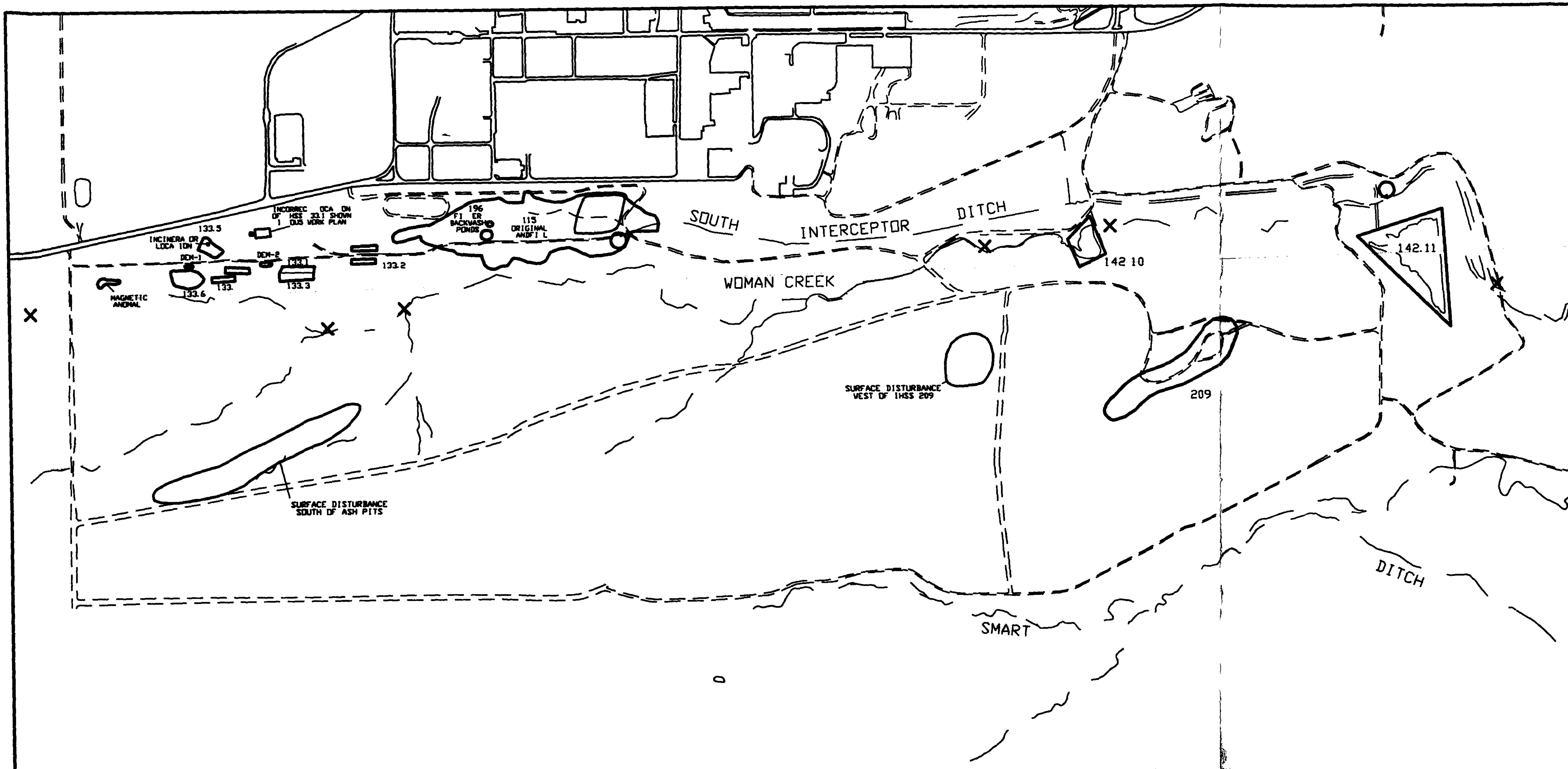
**EXTENT OF TOTAL METAL COCs IN STREAM SEDIMENTS**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

**FIGURE 4-11**




MAP LEGEND

STREAMS, DITCHES, DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
IHSS BOUNDARY

< Background Mean (BM)
> BM and <= BM 1 STD DEV
> BM 1 STD DEV and <- BM 2 STD DEV
> BM 2 STD DEV and <= BM 3 STD DEV
> BM 3 STD DEV

N

0 400 800
SCALE 1 = 800

Dr wn JWH 10/3/95 Date
Check d TZG 10/3/95 Date
Appr d MEW 10/10/95 Date

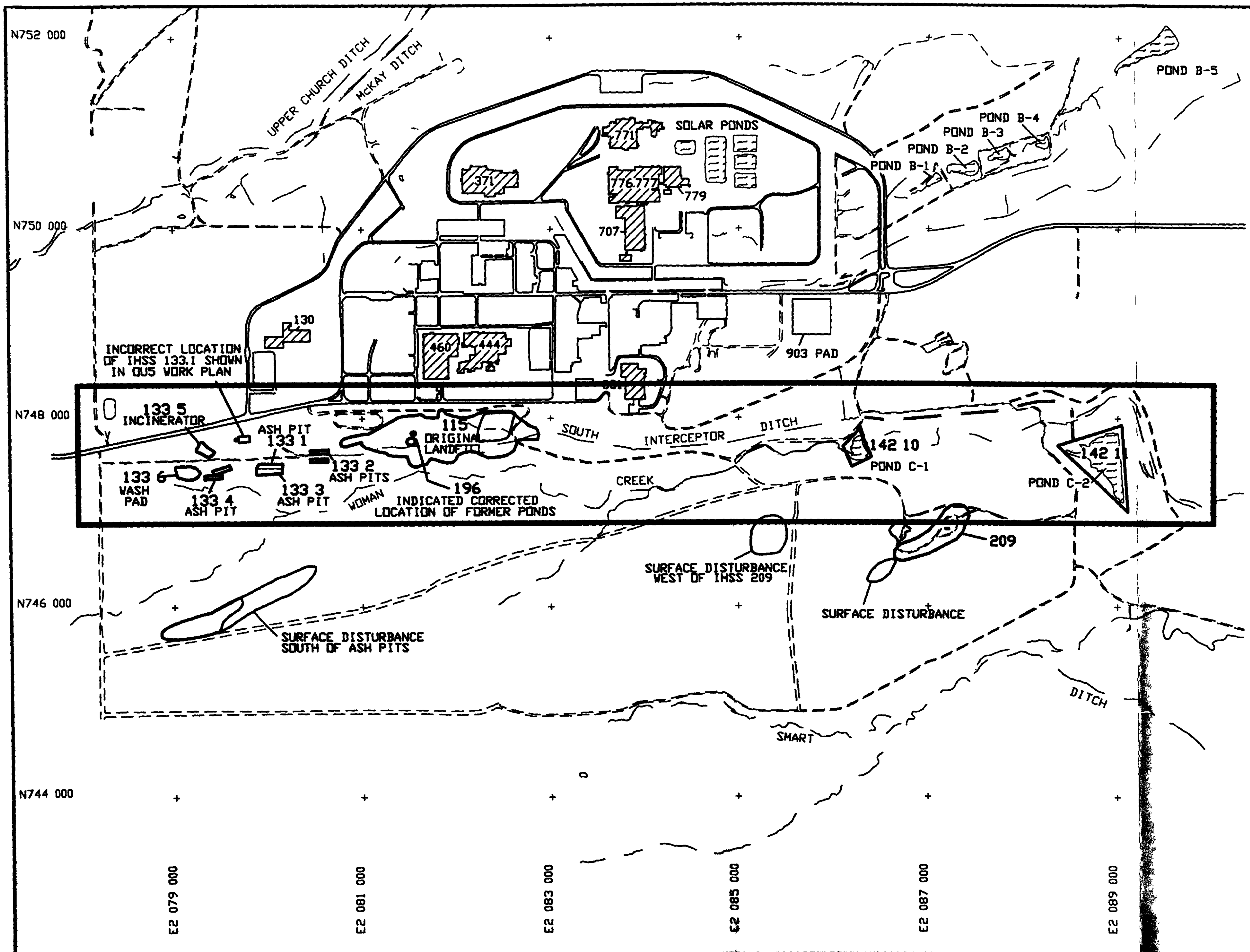
FILE OU5 4 12 DWG

EXTENT OF RADIONUCLIDE COCs IN STREAM SEDIMENTS

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT

FIGURE 4-12



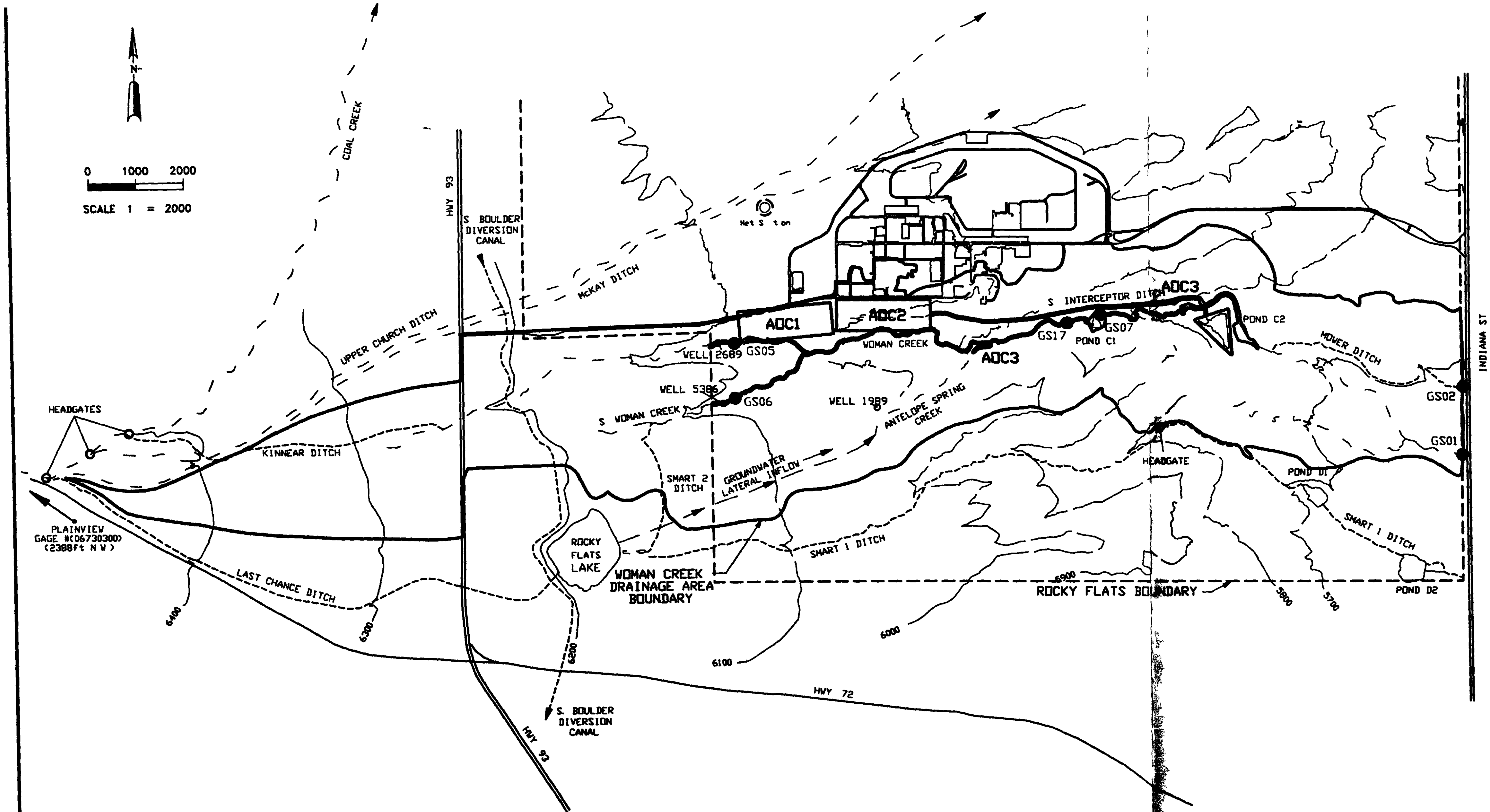

Drawn NAM 8/3/95 Date
Approved TEJ 8/3/95 Date
Approved Date

FILE OU5 5 4 DWG

**GROUNDWATER MODEL. SITE LOCATION MAP HIGHLIGHTING AREA MODELED**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT

FIGURE 5-4




GS = Gage Station (Surface Water Flow Rate)
AOC = Area Of Concern

| | |
|---|---|
| Drawn NAM | Date |
| Checked PEP | Date |
| Approved | Date |
| FILE OU5-5 18 DWG | |

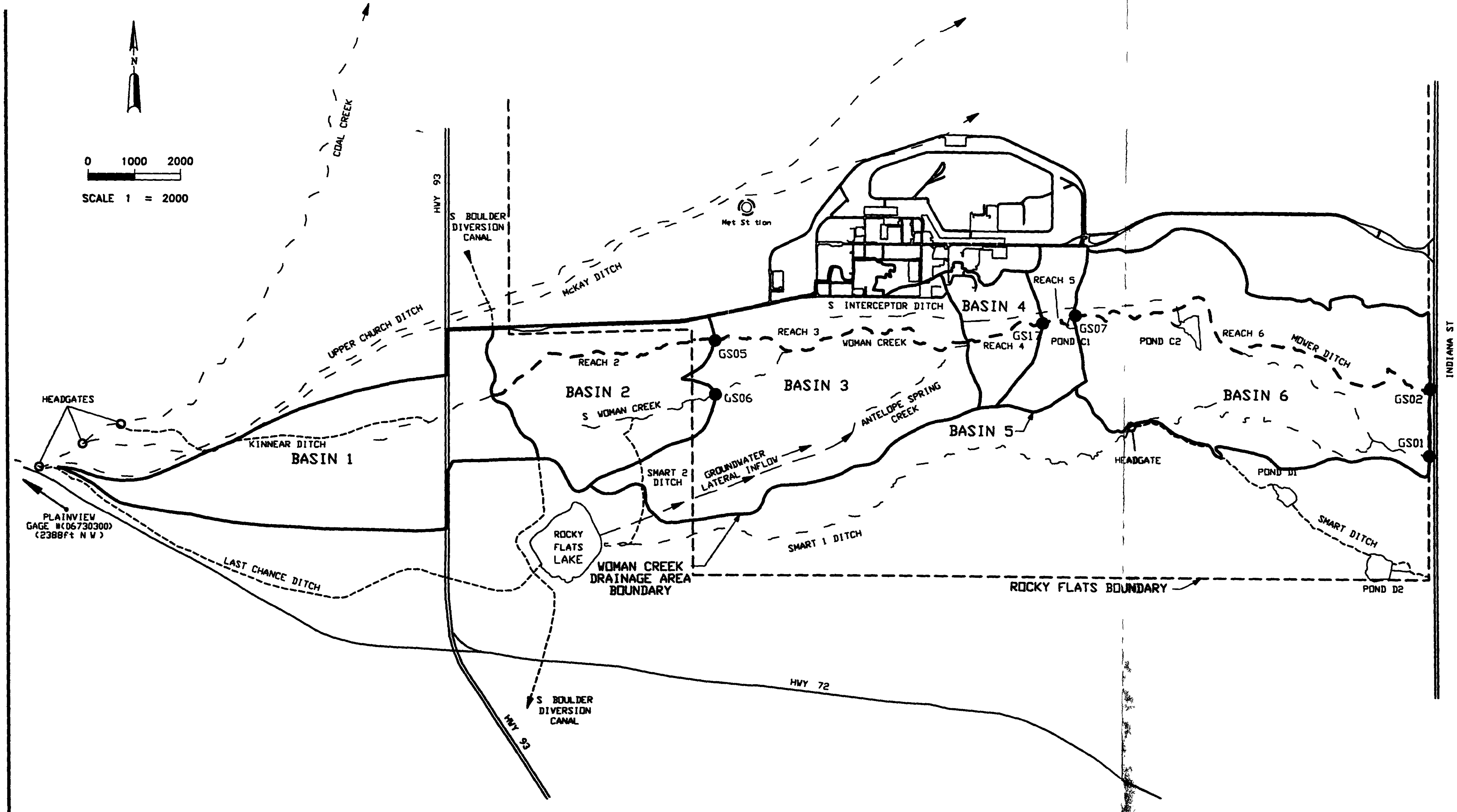
**WOMAN CREEK PLAINIMETRIC FEATURES**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 5-18




GS = Gage Station (Surface Water Flow Rate)

NOTE. For geometric properties of sub basins and stream reaches see table 2-1

| | |
|---|---|
| Drawn NAM | Date |
| Checked | Date |
| App oved | Date |
| FILE OU5-5-24 DWG | |

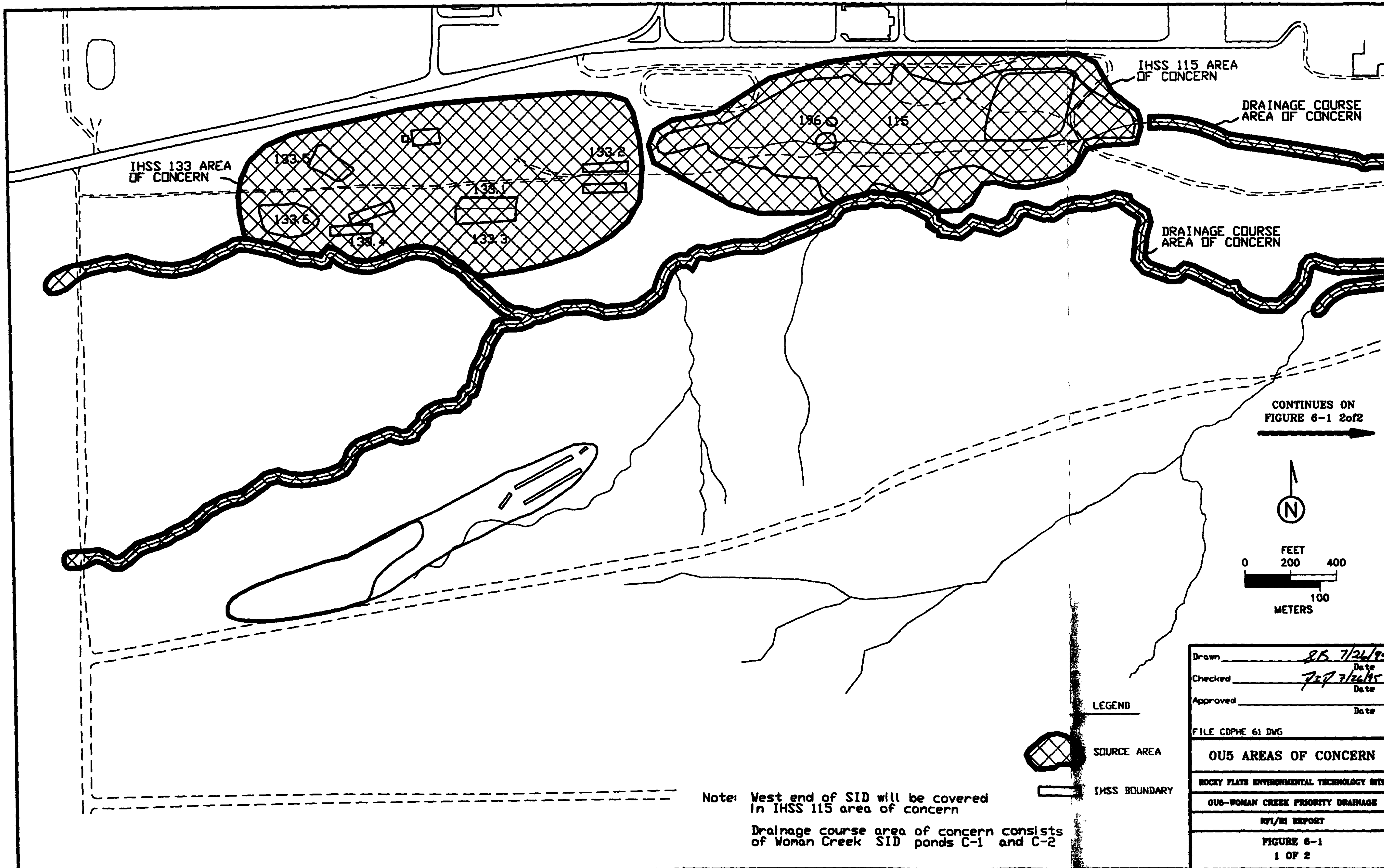
**WOMAN CREEK DRAINAGE BASIN LAYOUT**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

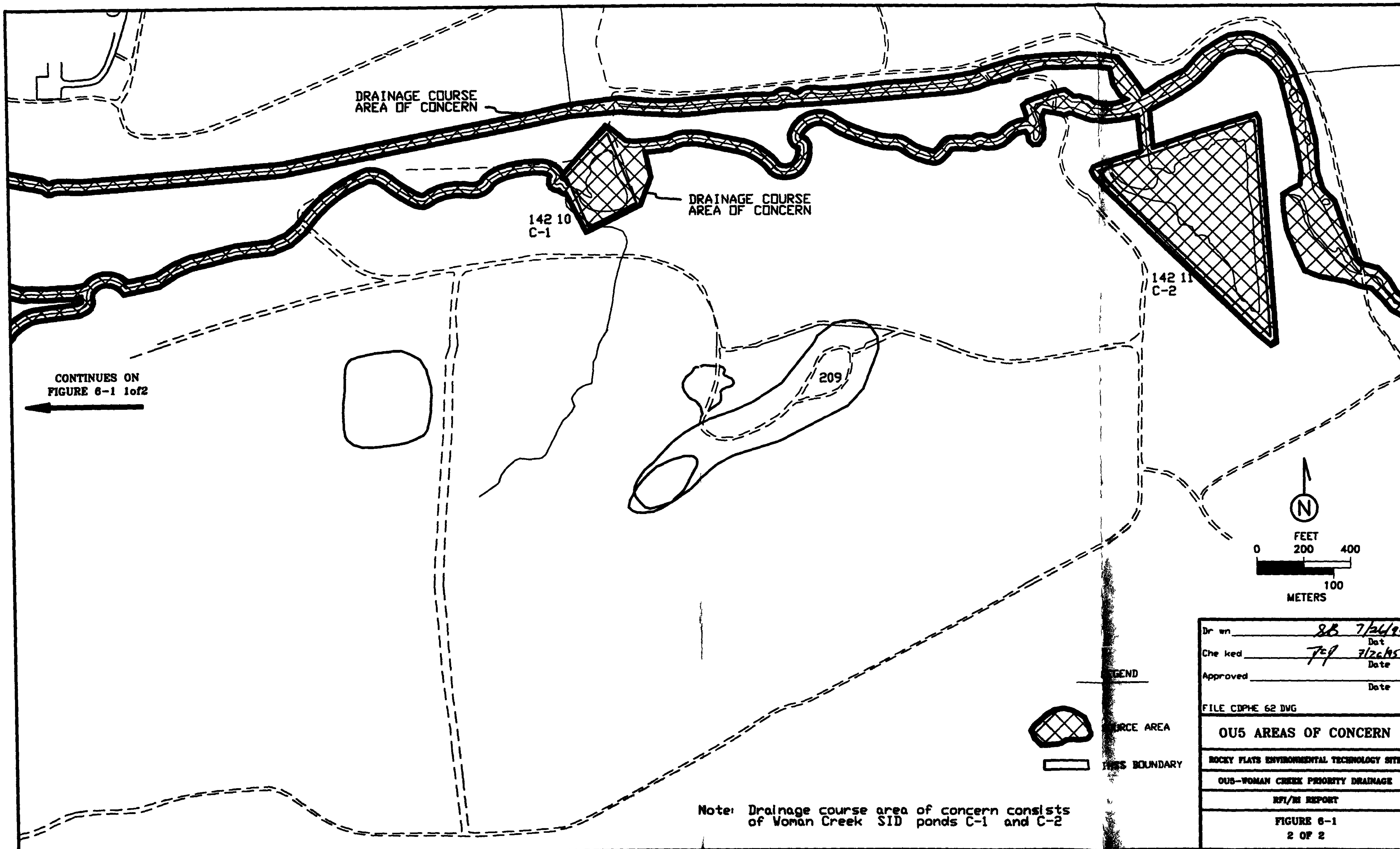
OU5 - WOMAN CREEK PRIORITY DRAINAGE

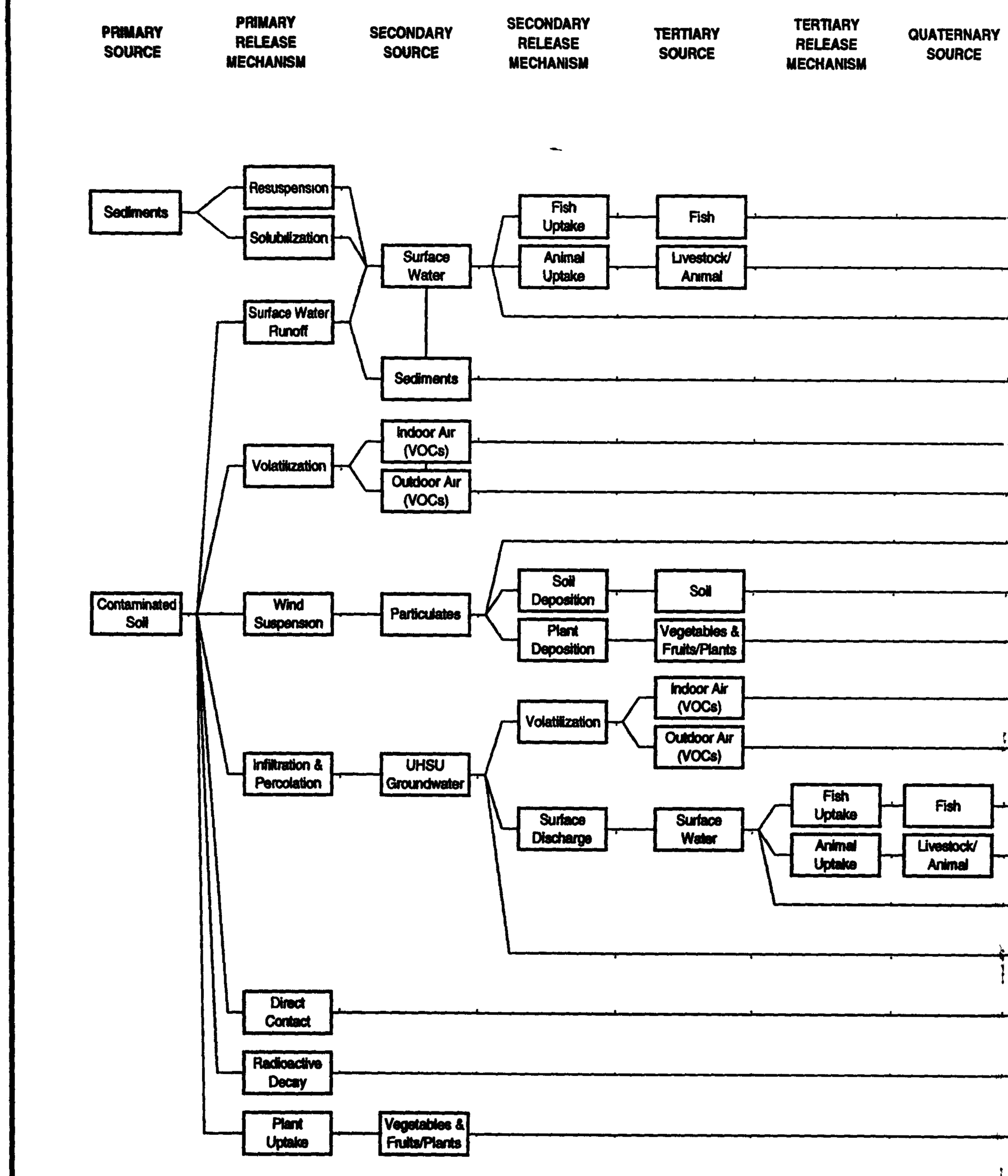
RFI/RI REPORT

FIGURE 5-24



IHSS 115 AREA OF CONCERN
DRAINAGE COURSE AREA OF CONCERN
DRAINAGE COURSE AREA OF CONCERN
IHSS 133 AREA OF CONCERN
196
115
133.1
133.2
133.3
133.4
133.5
133.6
CONTINUES ON FIGURE 6-1 2of2
N
FEET
0 200 400
100
METERS
LEGEND
SOURCE AREA
IHSS BOUNDARY
Note: West end of SID will be covered in IHSS 115 area of concern
Drainage course area of concern consists of Woman Creek SID ponds C-1 and C-2
Drawn 8B 7/26/95 Date
Checked 7/26/95 Date
Approved Date
FILE CDPHE 61 DWG
OU5 AREAS OF CONCERN
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 6-1
1 OF 2


DRAINAGE COURSE AREA OF CONCERN
142 10
C-1
DRAINAGE COURSE AREA OF CONCERN
142 11
C-2
209
CONTINUES ON FIGURE 6-1 1of2
N
FEET
0 200 400
100
METERS
BOUNDARY
Note: Drainage course area of concern consists of Woman Creek SID ponds C-1 and C-2
Dr wn SB 7/26/95
Dat
Che ked TCP 7/26/95
Date
Approved
Date
FILE CDPHE 62 DWG
OU5 AREAS OF CONCERN
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5-WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 6-1
2 OF 2




POTENTIALLY EXPOSED HUMAN RECEPTOR

| EXPOSURE ROUTE | Current Onsite Worker | Future Onsite Office Worker | Future Onsite Construction Worker | Future Onsite Ecological Researcher | Future Onsite Recreational Receptor |
|---|---|---|---|---|---|
| Oral | N | N | N | N | N |
| Oral | N | N | N | N | N |
| Oral | N | N | N | S | S |
| Dermal | N | N | N | I | I |
| Oral | N | N | N | S | S |
| Dermal | N | I | I | I | I |
| Inhalation | N | S | N | N | N |
| Inhalation | N | N | N | N | N |
| Inhalation | I | I | I | I | I |
| Oral | N | N | I | N | N |
| Dermal | N | N | I | N | N |
| Oral | N | N | N | N | N |
| Inhalation | N | S | N | N | N |
| Inhalation | N | N | N | N | N |
| Oral | N | N | N | N | N |
| Oral | N | N | N | N | N |
| Oral | N | N | N | S | S |
| Dermal | N | N | N | I | I |
| Oral | N | N | N | N | N |
| Oral | S | I | S | S | S |
| Dermal | I | I | I | I | I |
| External Radiation | I | I | I | I | I |
| Oral | N | N | N | N | N |

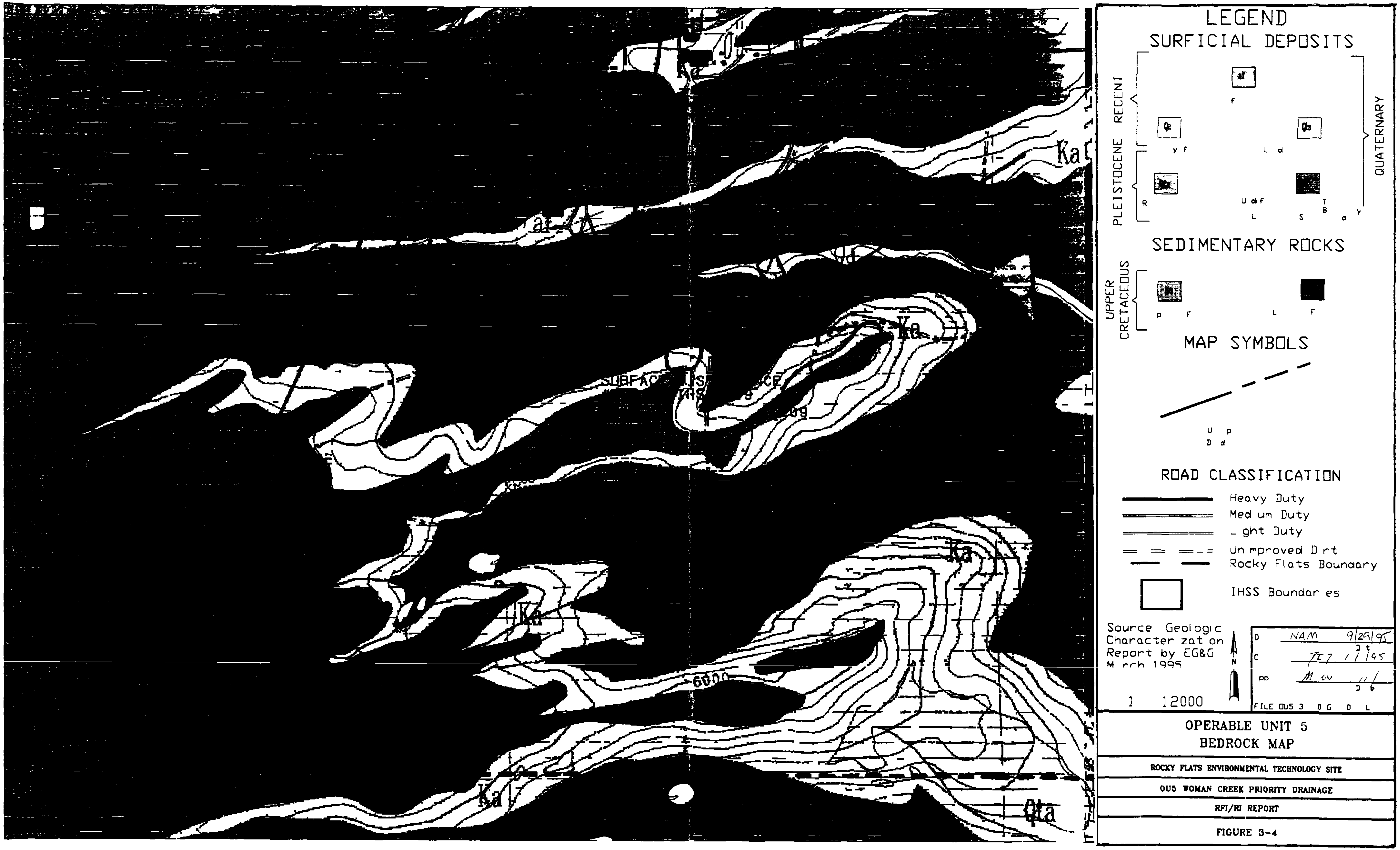
S Significant Potential Exposure Pathway
I Insignificant Potential Exposure Pathway
N Negligible or Incomplete Exposure Pathway
UHSU Upper Hydrostratigraphic Unit

NOTES
1 Potentially complete dermal pathways will be quantitatively assessed only if investigation demonstrates presence of organic contaminants of concern
2 Significant and insignificant potential exposure pathways will be quantitatively evaluated.

CONCEPTUAL SITE MODEL

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
OU5 WOMAN CREEK PRIORITY DRAINAGE
RFI/RI REPORT
FIGURE 6-3

OU5-SM.DWG



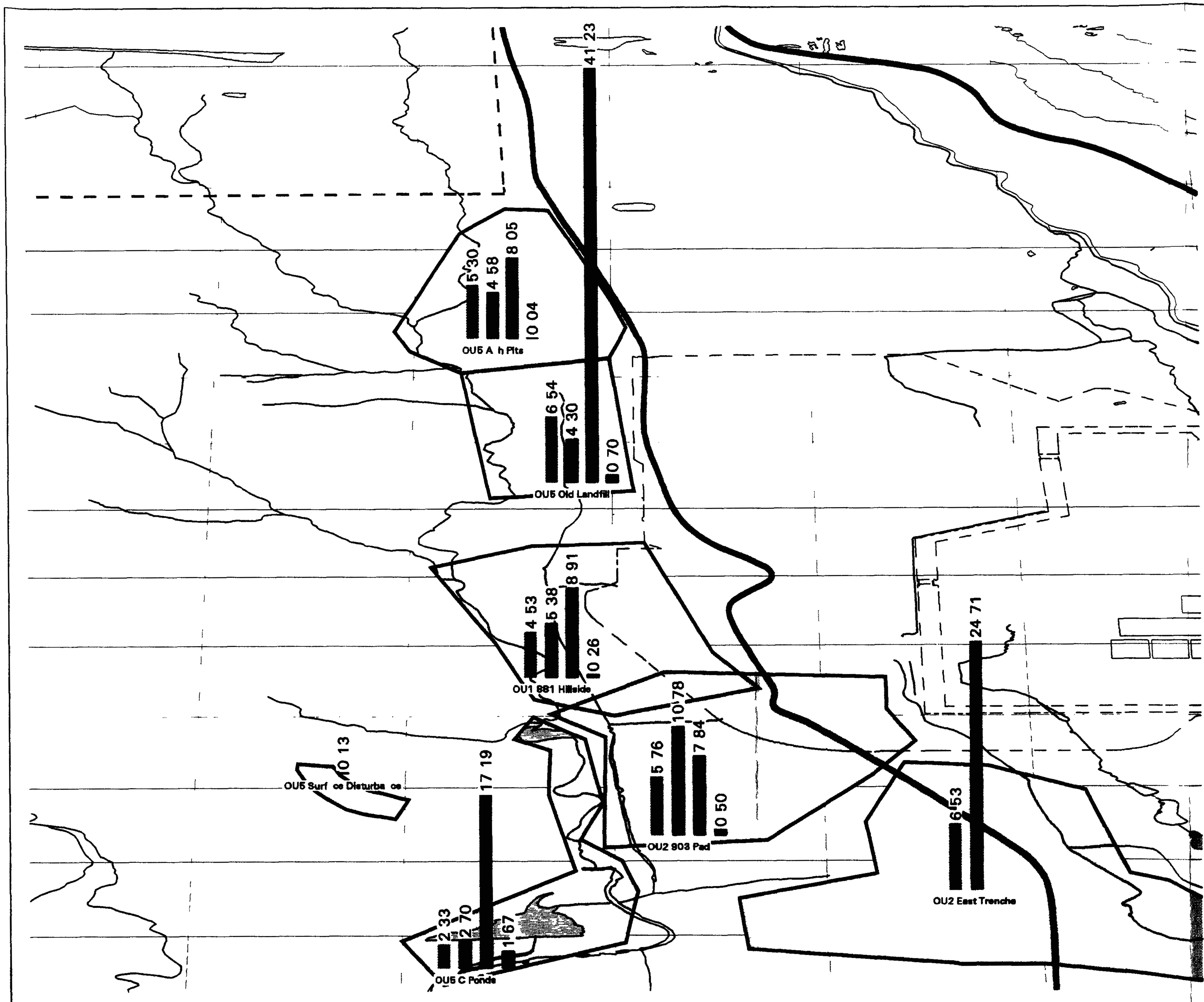

OPERABLE UNIT 5
BEDROCK MAP

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-4




U S Department of Energy
Rocky Flats Environmental Technology Site
Golden Colorado

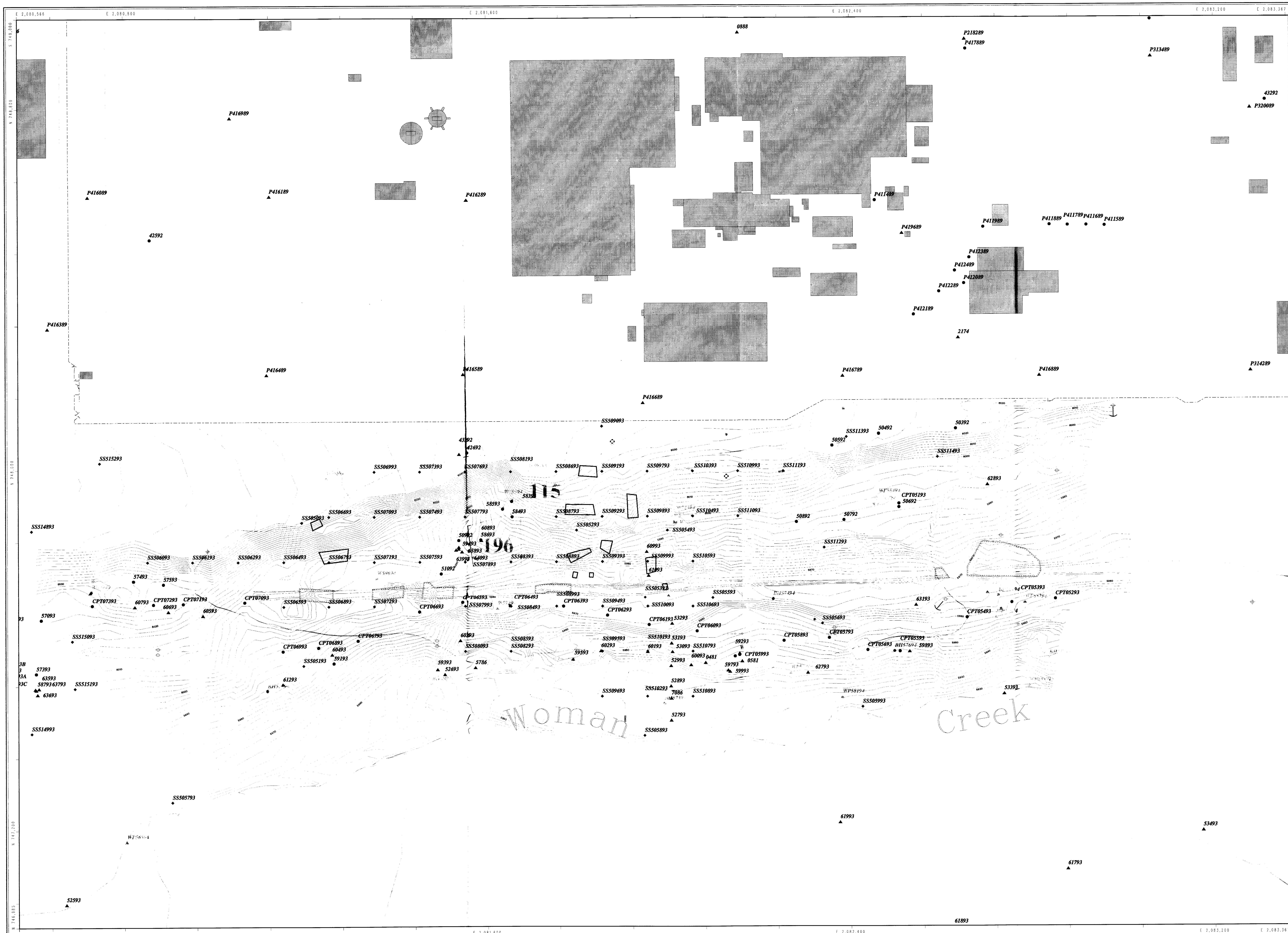
ERAs for Walnut Creek and Woman Creek Watersheds at RFETS

## Hazard Indices for Woman Creek Watershed

September 1995

Figure 7 2 2

27 SEP 1995 GRA $DATA3/swera/ c8area/maps/bar3dwoms.gra AML /export/home/dat 3/ w a/ c8 a/amls/ eport/ba 3d.aml




# Location Map
# IHSS 115/196

## Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences

## Map Features

- Individual Hazardous Substance Site
- 2 foot contours
- RCA
- Centerline 115kV Powerline
- RIP RAP areas
- Air Monitoring Station
- Power Poles Locations
- Manhole Locations
- Above Ground Gas line marker
- GUY
- Borehole locations
- Groundwater Well locations
- Surface Soil locations
- 1994 Borehole locations
- 1994 Groundwater Well locations
- 1994 Surface Soil locations

***DATA SOURCE:***
*Contour (2ft.) data provided by Paul Grabowski of Facilities Engr., EG&G Rocky Flats, Inc.- 1995.*
*Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.*
*Hydrology provided by USGS - (date unknown)*

Scale = 1 : 960
1 inch represents 80 feet

50 0 100 200ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

**Rocky Mountain Remediation Services, L.L.C.**
**Geographic Information Systems Group**
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, CO 80402-0464

| PROJECT NO. | | BY / DEPARTMENT | DATE |
|---|---|---|---|
| OU5 | GIS Analyst | W. Cheeks/RMRS/GIS | 09/27/95 |
| MAP ID | Checked | | |
| IHSS-115/196 | Approved | M. Wood/RMRS | |
| DATE CREATED | | | |
| September 27, 1995 | | | |


## LEGEND

| Symbol | Description |
|---|---|
| | Shallow groundwater area (indicated by thick, tall grass or other distinct vegetation). |
| | Spring |
| — — ? | Geologic contact, approximately located; dotted where concealed. |
| | Landslide area (some slide areas concealed by fill); based on examination of historic airphotos, field mapping and/or subsurface exploration; limits are approximately located, dotted where concealed, queried where uncertain. Arrow indicates discrete landslide with surface expression. See Note 1. |
| | Scarp (landslide-related unless noted otherwise). |
| Waste Fill | Sandy, Clayey Gravel and Cobbles (GC) derived from Qrf and Qc, and mixed with RFP production waste (wood, scrap metal, drums, graphite, concrete, etc.). Usually loose to medium dense; locally very loose. Inside edge of limits shown by |
| Fill | Road fill, other construction-related fill (e.g. for buried outfall pipe). Presumably clean (i.e., without admixed RFP waste). |
| Qc | Colluvium : Sandy, Clayey Gravel and Cobbles (GC), and Sandy Clay (CL); finer Qc concentrated on lower slopes below South Interceptor Ditch. Generally medium dense (gravel), stiff to very stiff (clay). Locally less dense / softer. |
| Qal | Valley Fill Alluvium : Sandy, Silty-Clayey Gravel and Cobbles (GM, GC). Generally medium dense to dense. |
| Qrf | Rocky Flats Alluvium : Sandy, Clayey Gravel and Cobbles (GC). Generally dense. Includes local interbeds of stiff to hard clays and sandy clays (CL), and medium dense to very dense, fine, clean to clayey sands (SP, SC). |

| Symbol | Description |
|---|---|
| G ┘└ G' | Geologic Section |
| 56993 | LOCATION CODE |
| ● | BOREHOLE LOCATION |
| ○ | WELL LOCATION |
| ⊗ | SMALL DIAMETER WELL |
| ⊙ | WELL POINT LOCATION |

NOTE:
1. OPERABLE UNIT 5 TOPOGRAPHY AS OF JANUARY 4, 1995.
2. SEE FIGURES 3-17 THROUGH 3-20 FOR GEOLOGIC CROSS SECTIONS.

SOURCE: EG&G, 1995e PRELIMINARY ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE OU-5 GEOTECHNICAL INVESTIGATION, DRAFT

| | | |
|---|---|---|
| Drawn | NAM | 10/2/95 Date |
| Checked | [illegible] | 10/3/95 Date |
| Approved | MRW | 10/10/95 Date |

FILE OU5-3-16.DWG

# GEOLOGIC CROSS SECTION LOCATION MAP IHSS 115/196

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

OU5 - WOMAN CREEK PRIORITY DRAINAGE

RFI/RI REPORT

FIGURE 3-16